

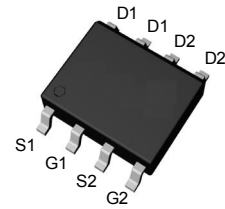
### Features

- -60V/-4A  
 $R_{DS(ON)} = 92m\Omega (typ.) @ V_{GS} = -10V$   
 $R_{DS(ON)} = 100m\Omega (typ.) @ V_{GS} = -4.5V$
- 100% UIS +  $R_g$  Tested
- Reliable and Rugged
- Lead Free and Green Devices Available (RoHS Compliant)

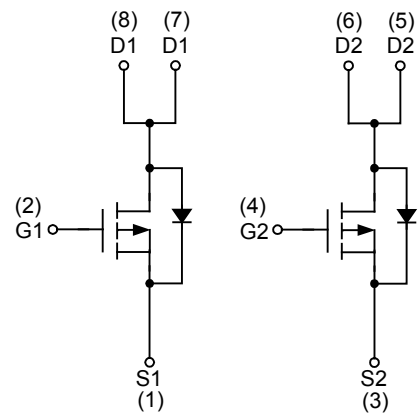
### Applications

- Power Management in Computer, Portable Equipment and Battery Powered Systems.
- Load Switches.
- Motor Control.

### Pin Description



Top View of SOP-8



P-Channel MOSFET

### Absolute Maximum Ratings (T<sub>A</sub>=25°C Unless Otherwise Noted)

| Symbol                        | Parameter                              |                      | Rating     | Unit |
|-------------------------------|----------------------------------------|----------------------|------------|------|
| Common Ratings                |                                        |                      |            |      |
| V <sub>DSS</sub>              | Drain-Source Voltage                   |                      | -60        | V    |
| V <sub>GSS</sub>              | Gate-Source Voltage                    |                      | ±20        |      |
| T <sub>J</sub>                | Maximum Junction Temperature           |                      | 150        | °C   |
| T <sub>STG</sub>              | Storage Temperature Range              |                      | -55 to 150 |      |
| I <sub>S</sub> <sup>b</sup>   | Diode Continuous Forward Current       | T <sub>A</sub> =25°C | -4         | A    |
| I <sub>D</sub> <sup>b</sup>   | Continuous Drain Current               | T <sub>A</sub> =25°C | -4         | A    |
|                               |                                        | T <sub>A</sub> =70°C | -1.6       |      |
| I <sub>DM</sub> <sup>a</sup>  | Pulsed Drain Current                   | T <sub>C</sub> =25°C | -12        |      |
| P <sub>D</sub> <sup>b</sup>   | Maximum Power Dissipation              | T <sub>A</sub> =25°C | 2          | W    |
|                               |                                        | T <sub>A</sub> =70°C | 1.3        |      |
| R <sub>θJA</sub> <sup>b</sup> | Thermal Resistance-Junction to Ambient | t ≤ 10s              | 62.5       | °C/W |
|                               |                                        | Steady state         | 100        |      |
| I <sub>AS</sub> <sup>c</sup>  | Avalanche Current, Single pulse        | L=0.1mH              | -18        | A    |
| E <sub>AS</sub> <sup>c</sup>  | Avalanche Energy, Single pulse         | L=0.1mH              | 16         | mJ   |

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

Note b : Surface Mounted on 1in<sup>2</sup> pad area, t ≤ 10s.

Note c : UIS tested and pulse width limited by maximum junction temperature 150°C (initial temperature T<sub>J</sub>=25°C).

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

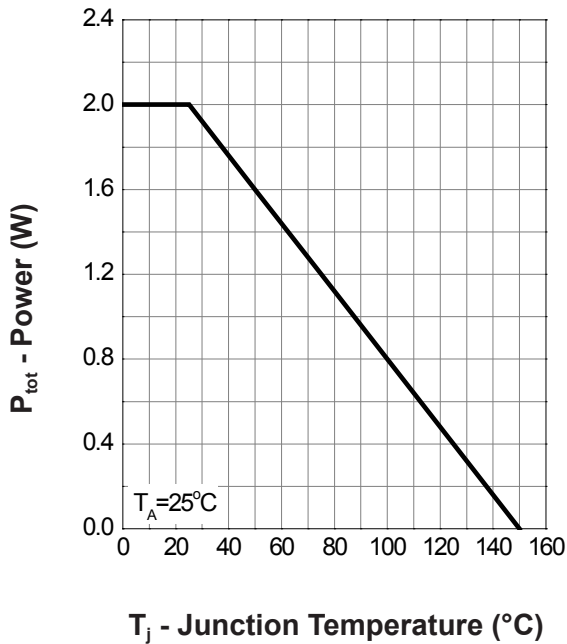
| Symbol                                   | Parameter                        | Test Conditions                                                                                                    | Min. | Typ. | Max. | Unit |
|------------------------------------------|----------------------------------|--------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| Static Characteristics                   |                                  |                                                                                                                    |      |      |      |      |
| BV <sub>DSS</sub>                        | Drain-Source Breakdown Voltage   | V <sub>GS</sub> =0V, I <sub>DS</sub> =-250μA                                                                       | -60  | -    | -    | V    |
| I <sub>DSS</sub>                         | Zero Gate Voltage Drain Current  | V <sub>DS</sub> =-48V, V <sub>GS</sub> =0V                                                                         | -    | -    | -1   | μA   |
|                                          |                                  | T <sub>J</sub> =85°C                                                                                               | -    | -    | -30  |      |
| V <sub>GS(th)</sub>                      | Gate Threshold Voltage           | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> =-250μA                                                         | -1.0 | -1.7 | -2.5 | 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> =-4A                                                                        | -    | 92   | 100  | mΩ   |
|                                          |                                  | V <sub>GS</sub> =-4.5V, I <sub>DS</sub> =-3A                                                                       | -    | 100  | 112  |      |
| Diode Characteristics                    |                                  |                                                                                                                    |      |      |      |      |
| V <sub>SD</sub> <sup>d</sup>             | Diode Forward Voltage            | I <sub>SD</sub> =-1A, V <sub>GS</sub> =0V                                                                          | -    | -0.7 | -1   | V    |
| t <sub>rr</sub>                          | Reverse Recovery Time            | I <sub>SD</sub> =-3.5A, dI <sub>SD</sub> /dt=100A/μs                                                               | -    | 21   | -    | ns   |
| Q <sub>rr</sub>                          | Reverse Recovery Charge          |                                                                                                                    | -    | 20   | -    | nC   |
| Dynamic Characteristics <sup>e</sup>     |                                  |                                                                                                                    |      |      |      |      |
| R <sub>G</sub>                           | Gate Resistance                  | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, F=1MHz                                                                   | -    | 10   | -    | Ω    |
| C <sub>iss</sub>                         | Input Capacitance                | V <sub>GS</sub> =0V,<br>V <sub>DS</sub> =-30V,<br>Frequency=1.0MHz                                                 | -    | 905  | 1095 | pF   |
| C <sub>oss</sub>                         | Output Capacitance               |                                                                                                                    | -    | 90   | -    |      |
| C <sub>rss</sub>                         | Reverse Transfer Capacitance     |                                                                                                                    | -    | 40   | -    |      |
| 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 | -    | 9    | 16   | ns   |
| t <sub>r</sub>                           | Turn-on Rise Time                |                                                                                                                    | -    | 5    | 9    |      |
| t <sub>d(OFF)</sub>                      | Turn-off Delay Time              |                                                                                                                    | -    | 40   | 72   |      |
| t <sub>f</sub>                           | Turn-off Fall Time               |                                                                                                                    | -    | 27   | 49   |      |
| Gate Charge Characteristics <sup>e</sup> |                                  |                                                                                                                    |      |      |      |      |
| Q <sub>g</sub>                           | Total Gate Charge                | V <sub>DS</sub> =-30V, V <sub>GS</sub> =-4.5V,<br>I <sub>DS</sub> =-3.5A                                           | -    | 5.5  | -    | nC   |
| Q <sub>g</sub>                           | Total Gate Charge                | V <sub>DS</sub> =-30V, V <sub>GS</sub> =-10V,<br>I <sub>DS</sub> =-3.5A                                            | -    | 12   | 17   |      |
| Q <sub>gs</sub>                          | Gate-Source Charge               |                                                                                                                    | -    | 2.3  | -    |      |
| Q <sub>gd</sub>                          | Gate-Drain Charge                |                                                                                                                    | -    | 2.3  | -    |      |

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

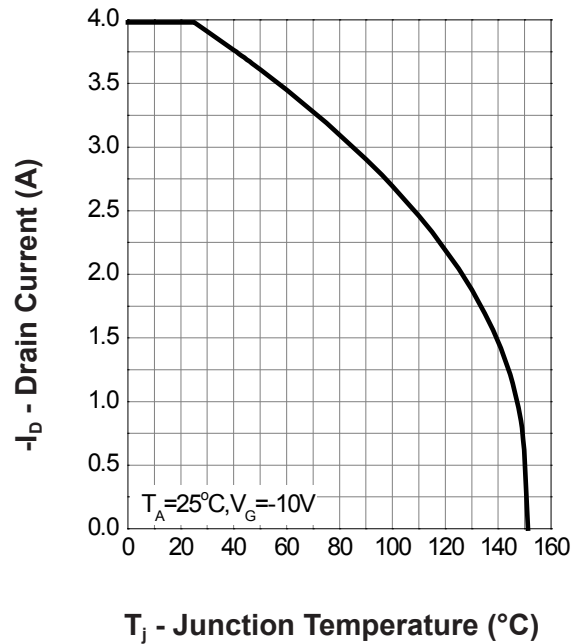
Note e : Guaranteed by design, not subject to production testing.

### Typical Operating Characteristics

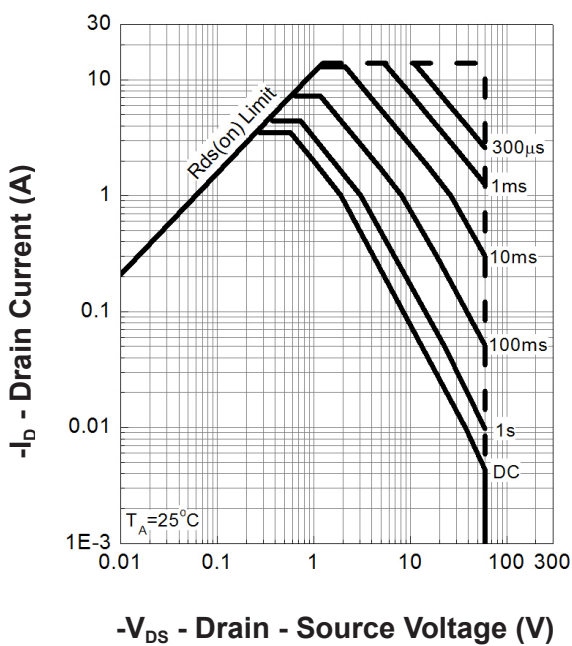
Power Dissipation



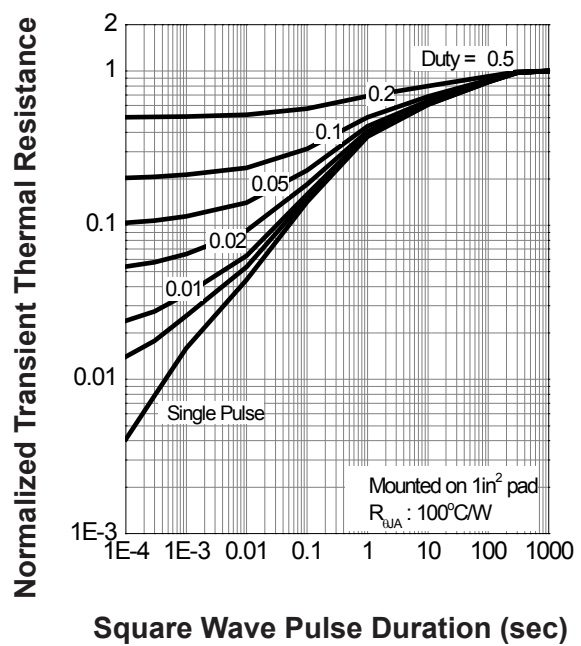
Drain Current



Safe Operation Area

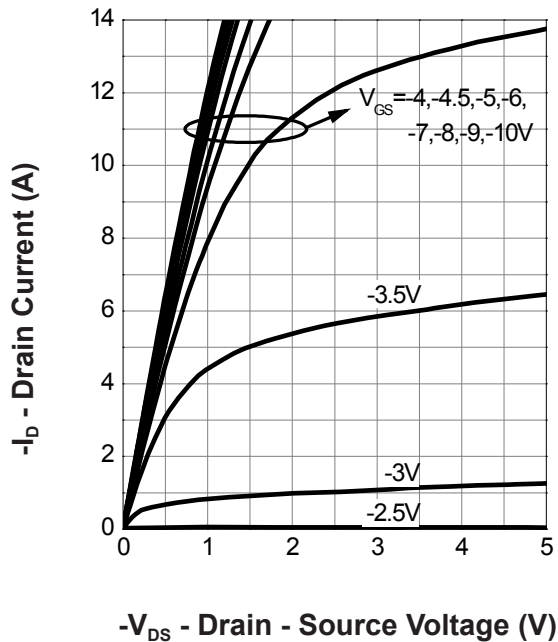


Thermal Transient Impedance

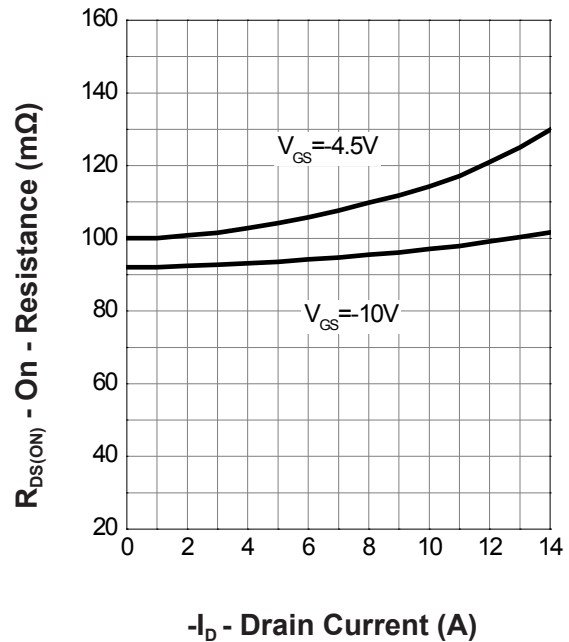


### Typical Operating Characteristics(Cont.)

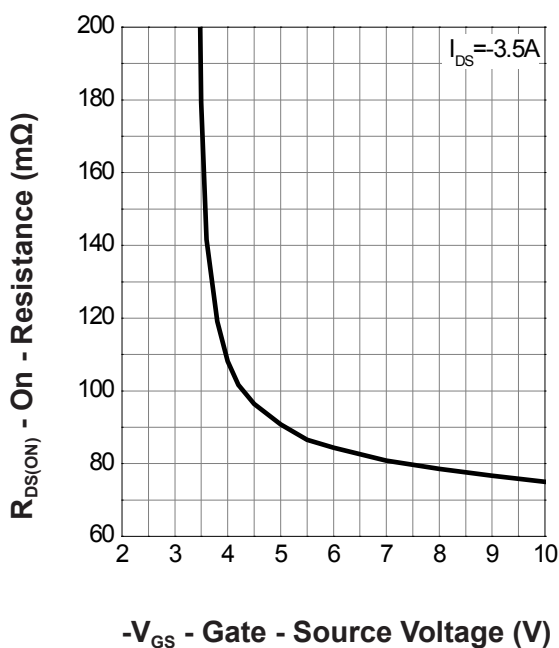
Output Characteristics



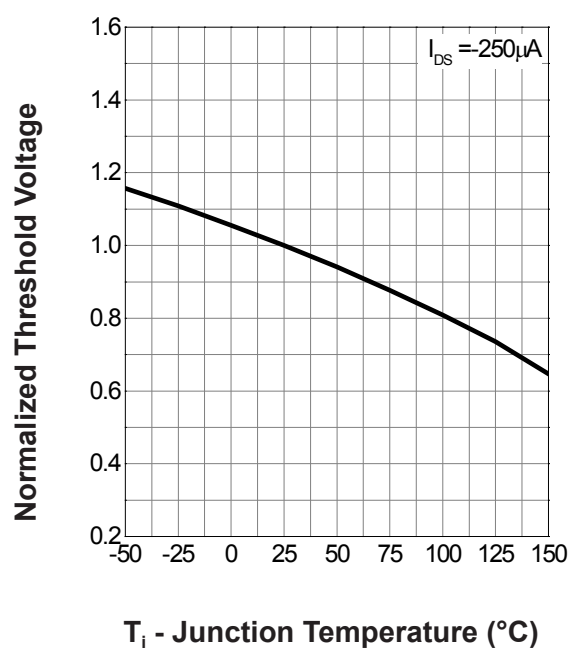
Drain-Source On Resistance



Gate-Source On Resistance

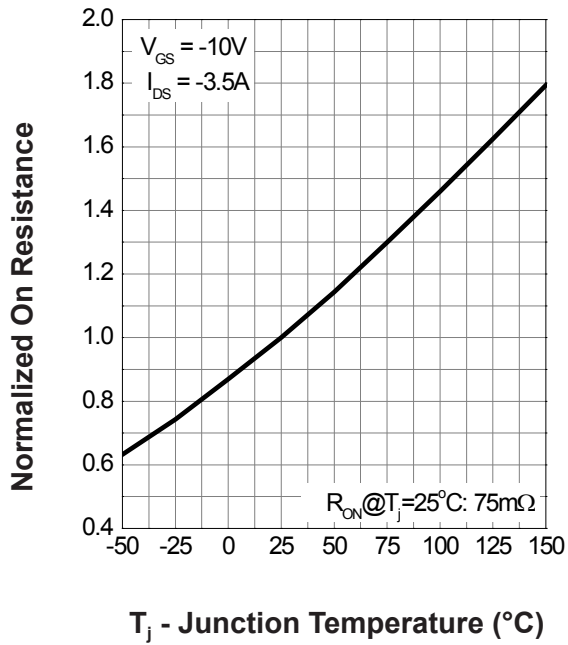


Gate Threshold Voltage

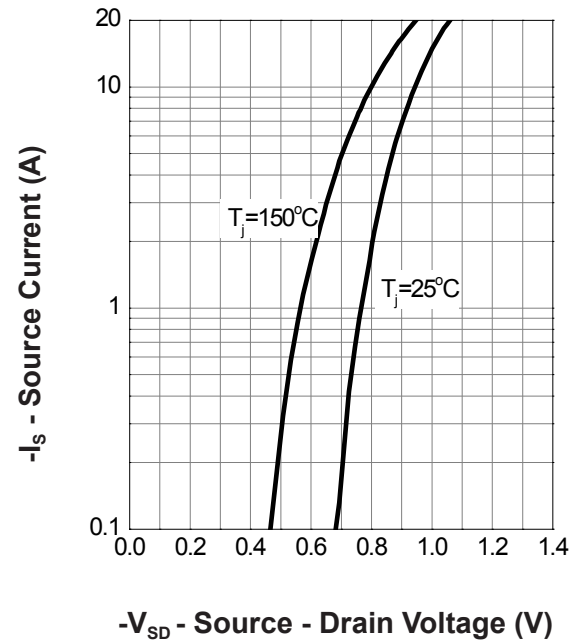


### Typical Operating Characteristics(Cont.)

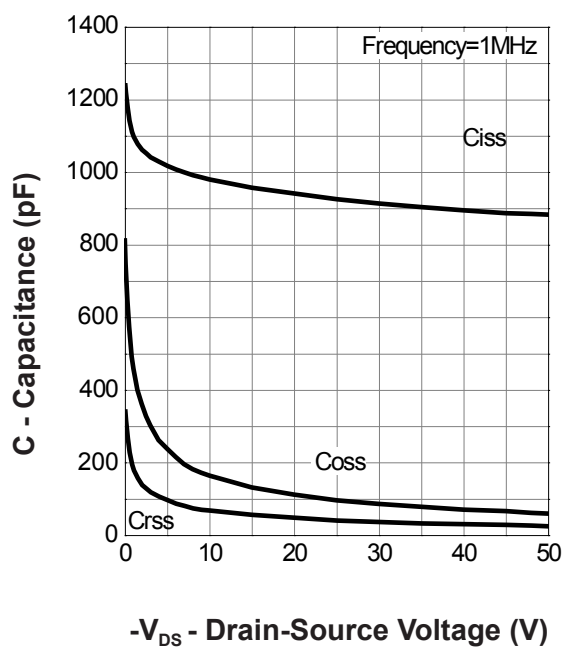
#### Drain-Source On Resistance



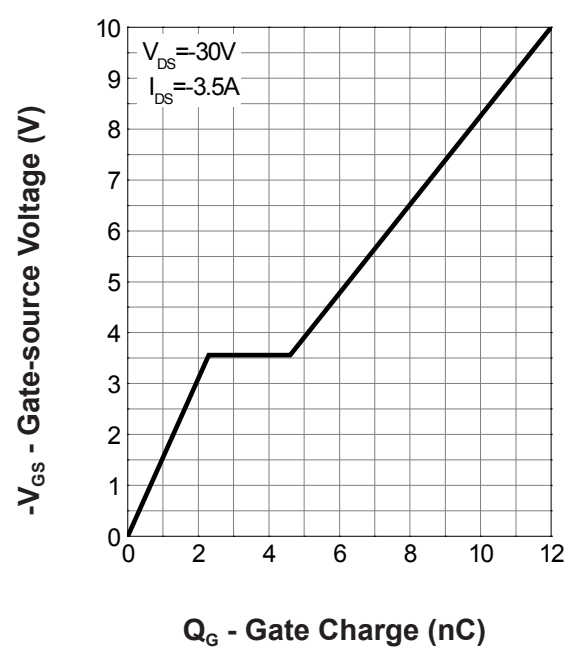
#### Source-Drain Diode Forward



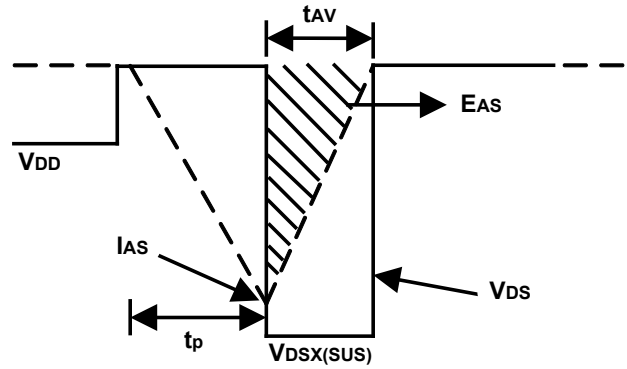
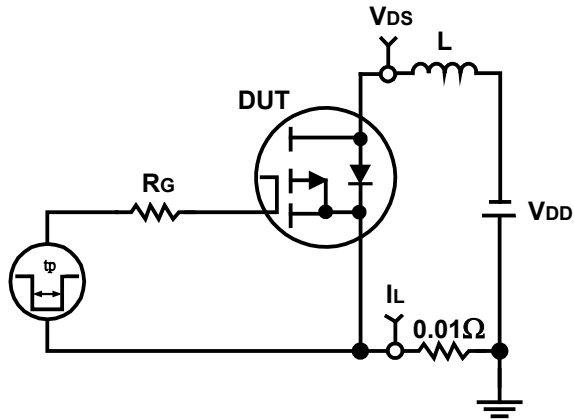
#### Capacitance



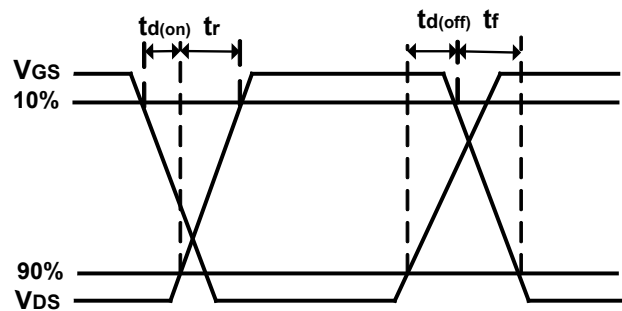
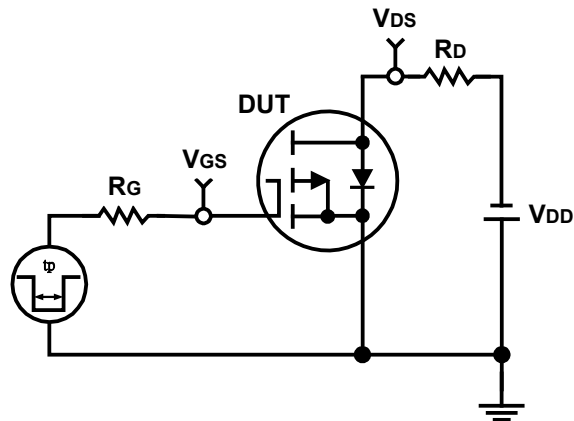
#### Gate Charge



### Avalanche Test Circuit and Waveforms

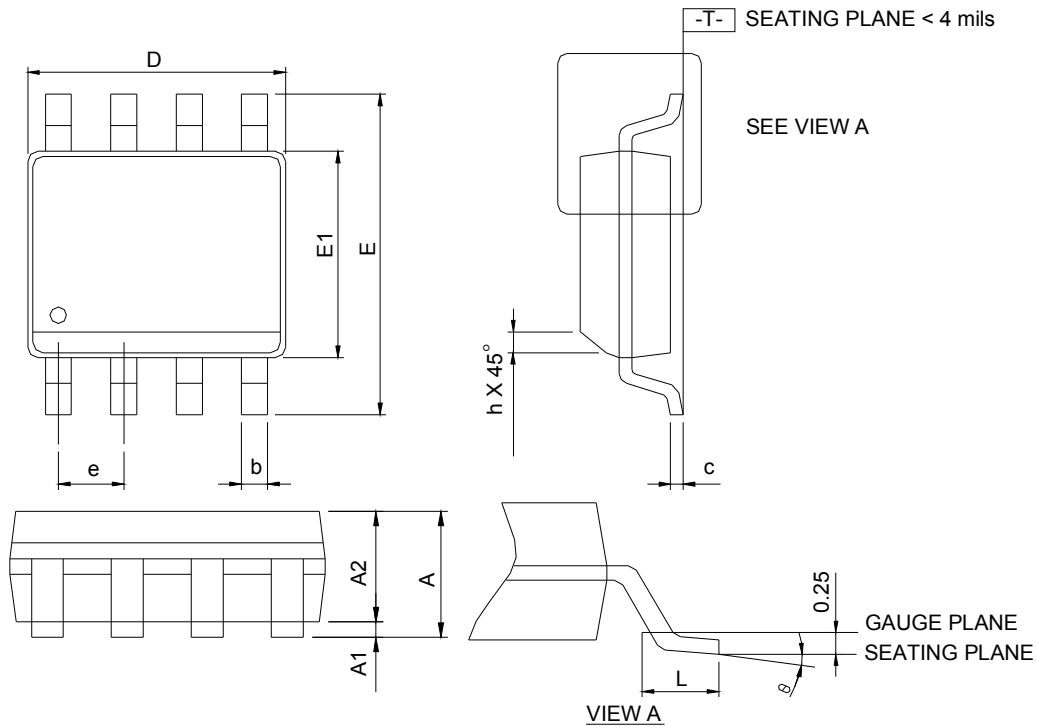


### Switching Time Test Circuit and Waveforms



### Package Information

#### SOP-8



| SYMBOL | SOP-8       |      |           |       |
|--------|-------------|------|-----------|-------|
|        | MILLIMETERS |      | INCHES    |       |
|        | MIN.        | MAX. | MIN.      | MAX.  |
| A      | -           | 1.75 | -         | 0.069 |
| A1     | 0.10        | 0.25 | 0.004     | 0.010 |
| A2     | 1.25        | -    | 0.049     | -     |
| b      | 0.31        | 0.51 | 0.012     | 0.020 |
| c      | 0.17        | 0.25 | 0.007     | 0.010 |
| D      | 4.80        | 5.00 | 0.189     | 0.197 |
| E      | 5.80        | 6.20 | 0.228     | 0.244 |
| E1     | 3.80        | 4.00 | 0.150     | 0.157 |
| e      | 1.27 BSC    |      | 0.050 BSC |       |
| h      | 0.25        | 0.50 | 0.010     | 0.020 |
| L      | 0.40        | 1.27 | 0.016     | 0.050 |
| θ      | 0°          | 8°   | 0°        | 8°    |

Note: 1. Follow JEDEC MS-012 AA.

2. Dimension D" does not include mold flash, protrusions or gate burrs.  
Mold flash, protrusion or gate burrs shall not exceed 6 mil per side.

3. Dimension E" does not include inter-lead flash or protrusions.  
Inter-lead flash and protrusions shall not exceed 10 mil per side.

#### RECOMMENDED LAND PATTERN

