

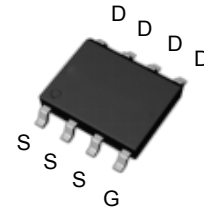
## Features

- 40V/15A,  
 $R_{DS(ON)} = 6 \text{ m}\Omega \text{ (typ.) @ } V_{GS} = 10\text{V}$   
 $R_{DS(ON)} = 11\text{m}\Omega \text{ (typ.) @ } V_{GS} = 4.5\text{V}$
- Reliable and Rugged
- Lead Free and Green Devices Available  
(RoHS Compliant)

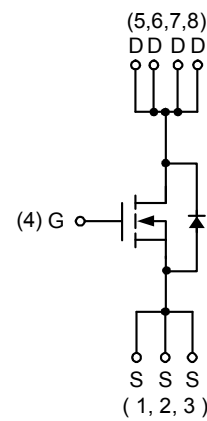
## Applications

- Power Management in Desktop Computer or DC/DC Converters.

## Pin Description



Top View of SOP-8



N-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                   |                      | 40         | 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>               | Diode Continuous Forward Current       | T <sub>A</sub> =25°C | 15         | A    |
| I <sub>D</sub>               | Continuous Drain Current               | T <sub>A</sub> =25°C | 15         | A    |
|                              |                                        | T <sub>A</sub> =70°C | 11.3       |      |
| I <sub>DM</sub> <sup>a</sup> | Pulsed Drain Current                   | T <sub>A</sub> =25°C | 45         |      |
| P <sub>D</sub>               | Maximum Power Dissipation              | T <sub>A</sub> =25°C | 2.08       | W    |
|                              |                                        | T <sub>A</sub> =70°C | 1.3        |      |
| R <sub>θJA</sub>             | Thermal Resistance-Junction to Ambient | t ≤ 10s              | 30         | °C/W |
|                              |                                        | Steady State         | 60         |      |
| R <sub>θJL</sub>             | Thermal Resistance-Junction to Lead    | Steady State         | 20         |      |
| I <sub>AS</sub> <sup>b</sup> | Avalanche Current, Single pulse        | L=0.1mH              | 23         | A    |
| E <sub>AS</sub> <sup>b</sup> | Avalanche Energy, Single pulse         | L=0.1mH              | 26         | mJ   |

Note a : Max. current is limited by bonding wire.

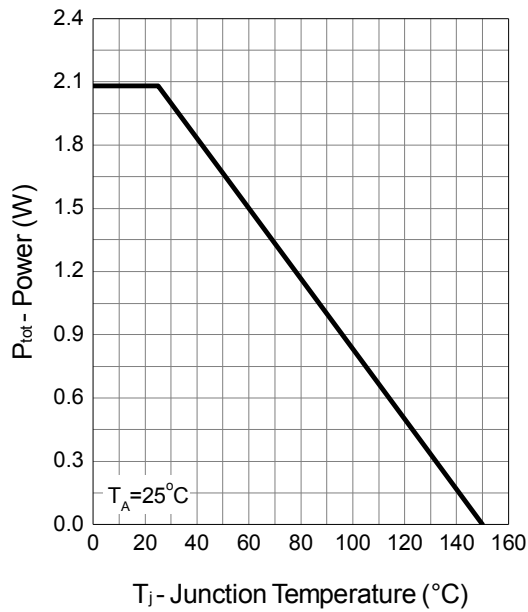
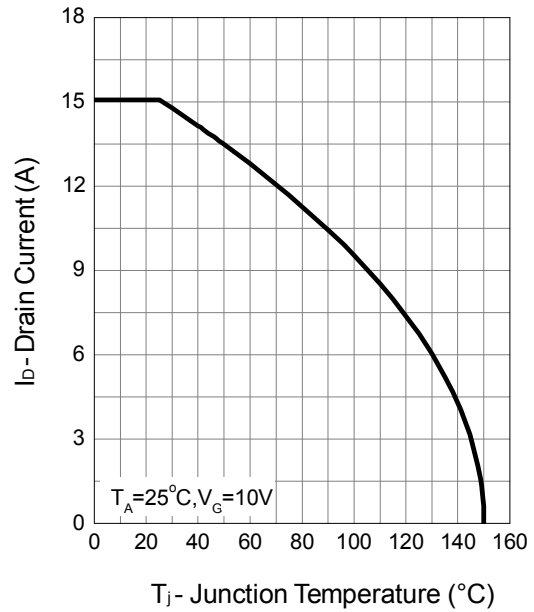
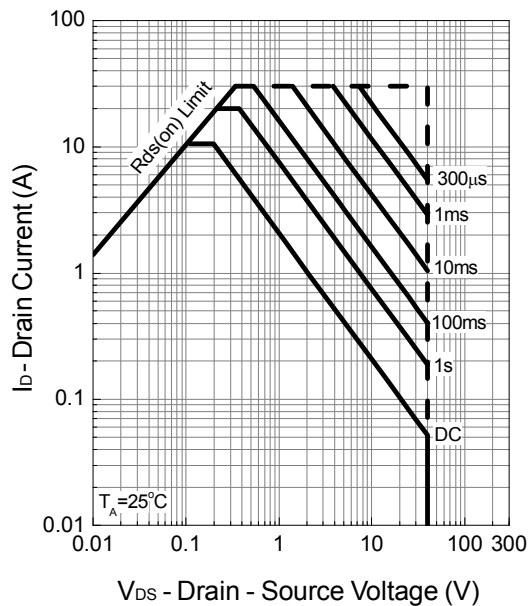
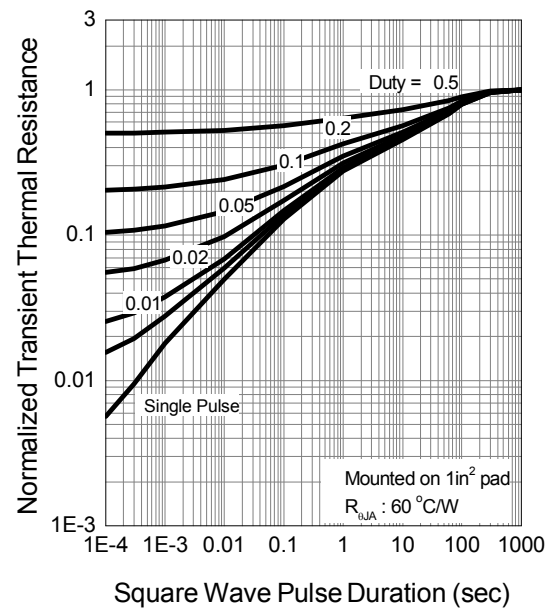
Note b : UIS tested and pulse width limited by maximum junction temperature 150°C (initial temperature T<sub>J</sub>=25°C).

## Electrical Characteristics (T<sub>A</sub> = 25°C Unless Otherwise Noted)

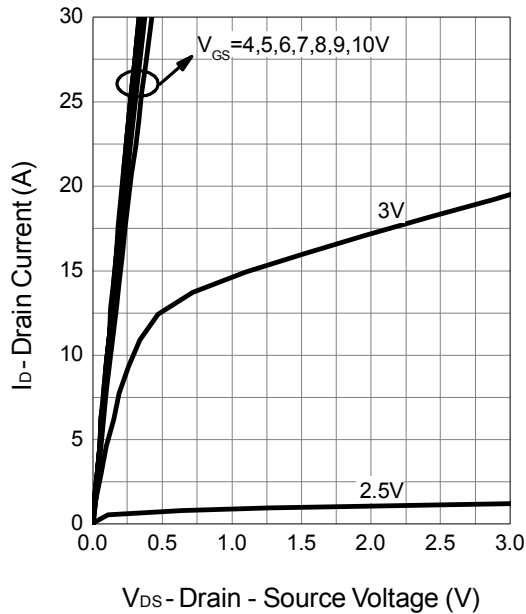
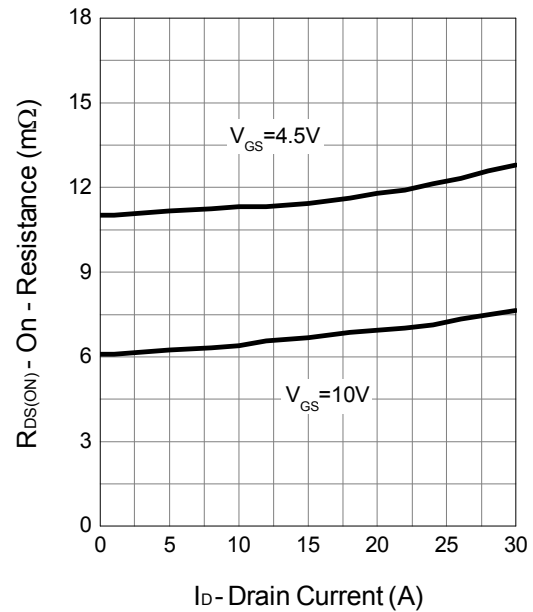
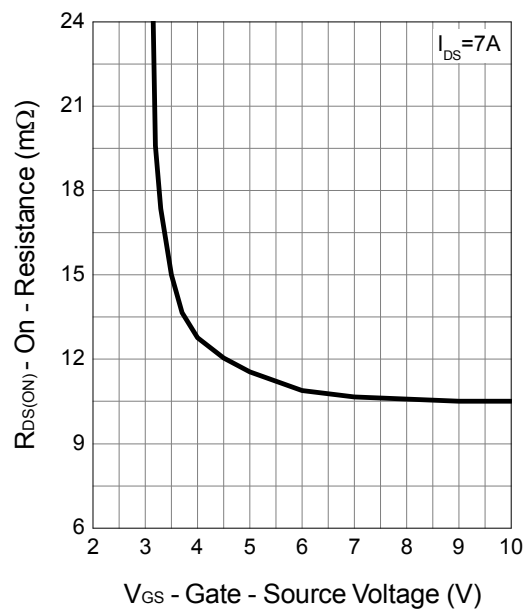
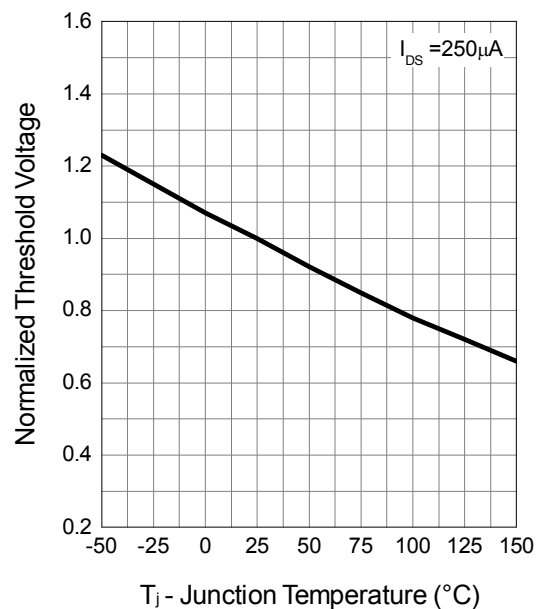
| Symbol                                   | Parameter                        | Test Conditions                                                                                                 | Min.   | Typ.   | Max.    | Unit |
|------------------------------------------|----------------------------------|-----------------------------------------------------------------------------------------------------------------|--------|--------|---------|------|
| Static Characteristics                   |                                  |                                                                                                                 |        |        |         |      |
| BV <sub>DSS</sub>                        | Drain-Source Breakdown Voltage   | V <sub>GS</sub> =0V, I <sub>DS</sub> =250μA                                                                     | 40     | -      | -       | V    |
| I <sub>DSS</sub>                         | Zero Gate Voltage Drain Current  | V <sub>DS</sub> =32V, V <sub>GS</sub> =0V<br>T <sub>J</sub> =85°C                                               | -<br>- | -<br>- | 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                                                       | 1.0    | 1.8    | 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>c</sup>         | Drain-Source On-state Resistance | V <sub>GS</sub> =10V, I <sub>DS</sub> =7A<br>T <sub>J</sub> =125°C                                              | -<br>- | 6<br>9 | 9<br>-  | mΩ   |
| Gfs                                      | Forward Transconductance         | V <sub>DS</sub> =5V, I <sub>DS</sub> =15A                                                                       | -      | 31     | -       | S    |
| Diode Characteristics                    |                                  |                                                                                                                 |        |        |         |      |
| V <sub>SD</sub> <sup>c</sup>             | Diode Forward Voltage            | I <sub>SD</sub> =10A, V <sub>GS</sub> =0V                                                                       | -      | 0.9    | 1.1     | V    |
| t <sub>rr</sub>                          | Reverse Recovery Time            | V <sub>DD</sub> =20V,<br>I <sub>SD</sub> =10A, dI <sub>SD</sub> /dt=100A/μs                                     | -      | 15.2   | -       | ns   |
| t <sub>a</sub>                           | Charge Time                      |                                                                                                                 | -      | 9.4    | -       |      |
| t <sub>b</sub>                           | Discharge Time                   |                                                                                                                 | -      | 5.8    | -       |      |
| Q <sub>rr</sub>                          | Reverse Recovery Charge          |                                                                                                                 | -      | 9.5    | -       | nC   |
| Dynamic Characteristics <sup>d</sup>     |                                  |                                                                                                                 |        |        |         |      |
| R <sub>G</sub>                           | Gate Resistance                  | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, F=1MHz                                                                | 0.7    | 1.1    | 1.8     | Ω    |
| C <sub>iss</sub>                         | Input Capacitance                | V <sub>GS</sub> =0V,<br>V <sub>DS</sub> =20V,<br>Frequency=1.0MHz                                               | -      | 3125   | -       | pF   |
| C <sub>oss</sub>                         | Output Capacitance               |                                                                                                                 | -      | 332    | -       |      |
| C <sub>rss</sub>                         | Reverse Transfer Capacitance     |                                                                                                                 | -      | 270    | -       |      |
| t <sub>d(ON)</sub>                       | Turn-on Delay Time               | V <sub>DD</sub> =20V, R <sub>L</sub> =20Ω,<br>I <sub>DS</sub> =1A, V <sub>GEN</sub> =10V,<br>R <sub>G</sub> =1Ω | -      | 12.6   | -       | ns   |
| t <sub>r</sub>                           | Turn-on Rise Time                |                                                                                                                 | -      | 10     | -       |      |
| t <sub>d(OFF)</sub>                      | Turn-off Delay Time              |                                                                                                                 | -      | 23.6   | -       |      |
| t <sub>f</sub>                           | Turn-off Fall Time               |                                                                                                                 | -      | 6      | -       |      |
| Gate Charge Characteristics <sup>d</sup> |                                  |                                                                                                                 |        |        |         |      |
| Q <sub>g</sub>                           | Total Gate Charge                | V <sub>DS</sub> =20V, V <sub>GS</sub> =4.5V,<br>I <sub>DS</sub> =7A                                             | -      | 9.4    | -       | nC   |
| Q <sub>g</sub>                           | Total Gate Charge                | V <sub>DS</sub> =20V, V <sub>GS</sub> =10V,<br>I <sub>DS</sub> =7A                                              | -      | 20     | 28      |      |
| Q <sub>gth</sub>                         | Threshold Gate Charge            |                                                                                                                 | -      | 2      | -       |      |
| Q <sub>gs</sub>                          | Gate-Source Charge               |                                                                                                                 | -      | 3.9    | -       |      |
| Q <sub>gd</sub>                          | Gate-Drain Charge                |                                                                                                                 | -      | 3      | -       |      |

Note c : Pulse test ; pulse width≤300μs, duty cycle≤2%.

## Typical Operating Characteristics

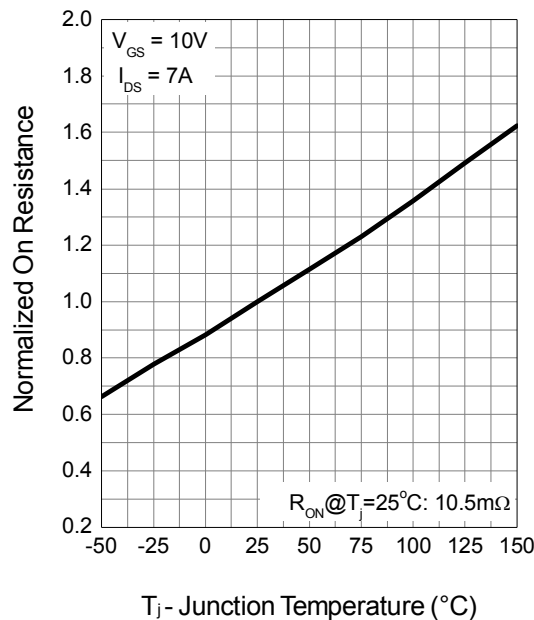
**Power Dissipation**

**Drain Current**

**Safe Operation Area**

**Thermal Transient Impedance**


## Typical Operating Characteristics (Cont.)

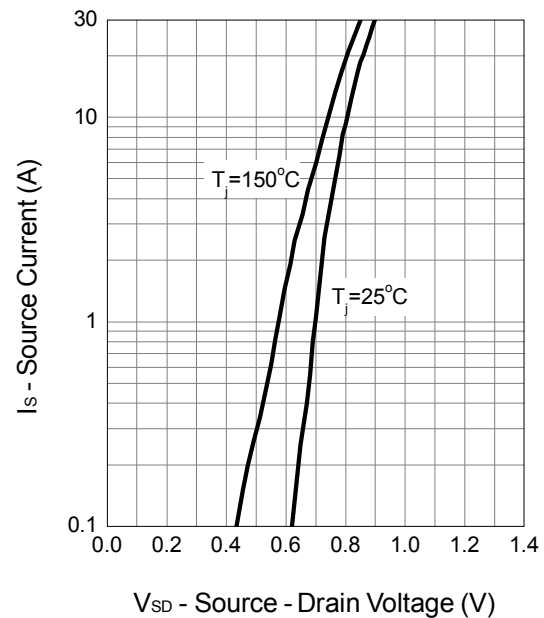
**Output Characteristics**

**Drain-Source On Resistance**

**Gate-Source On Resistance**

**Gate Threshold Voltage**


## Typical Operating Characteristics (Cont.)

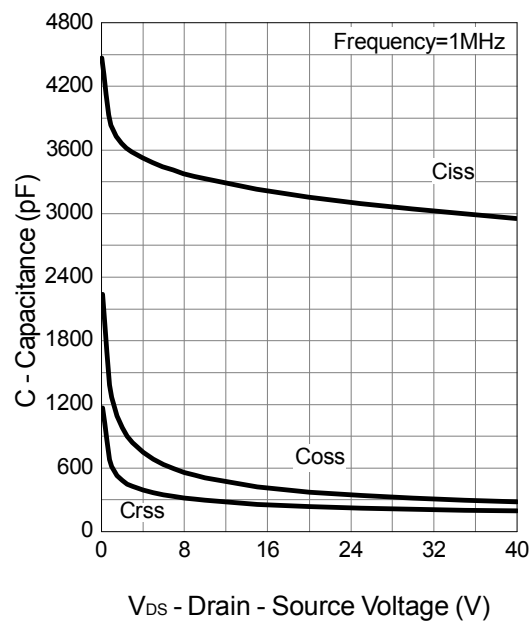
Drain-Source On Resistance



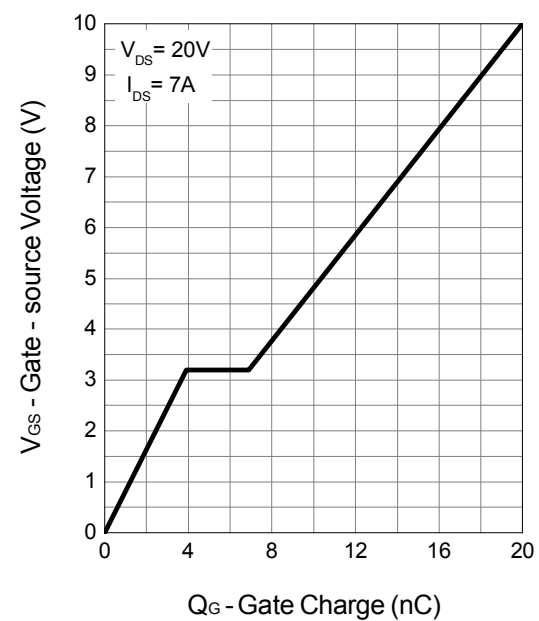
Source-Drain Diode Forward



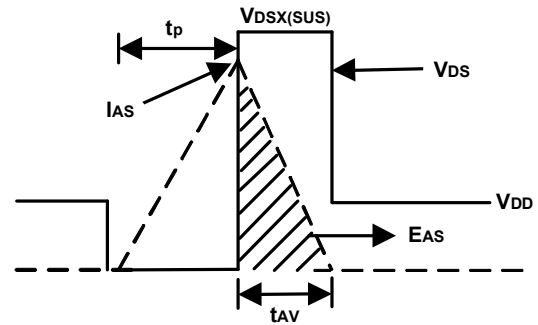
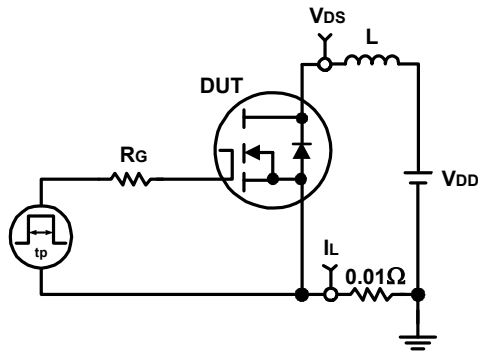
Capacitance



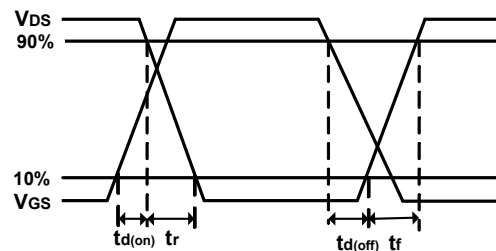
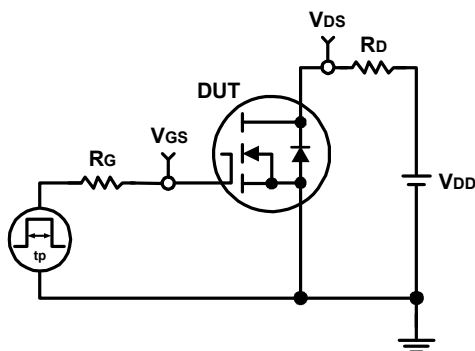
Gate Charge



## Avalanche Test Circuit and Waveforms

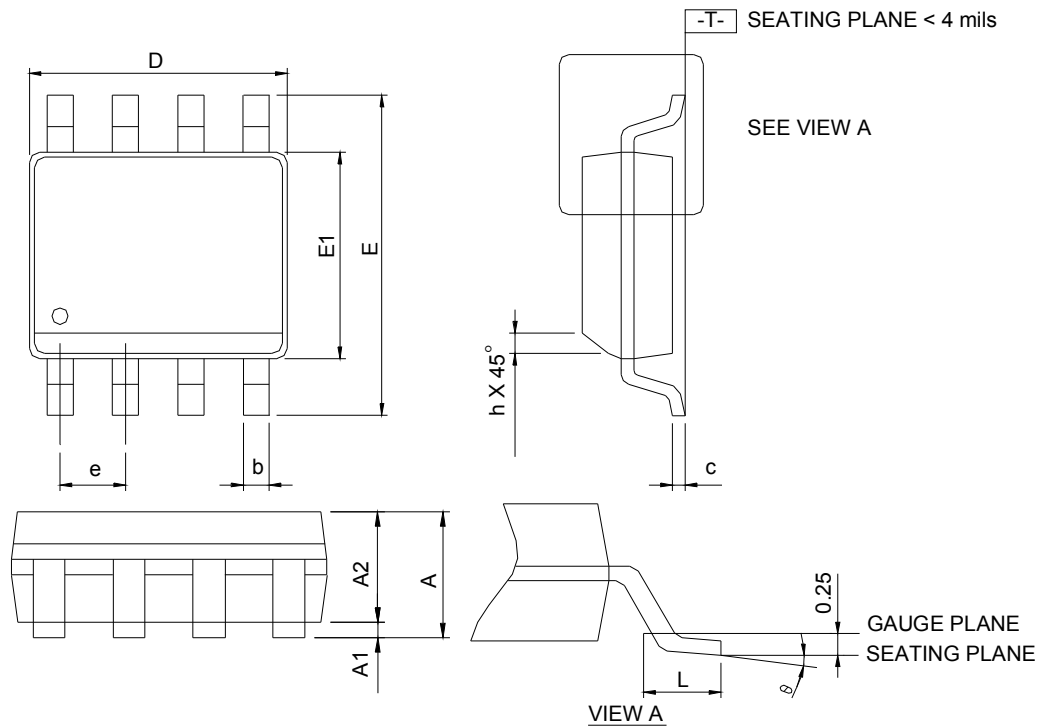


## Switching Time Test Circuit and Waveforms



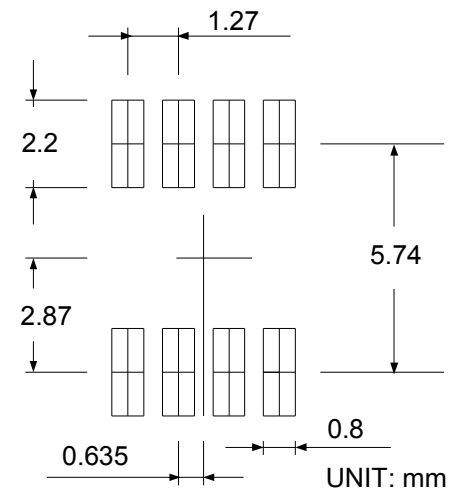
## Package Information

### SOP-8



| DIMENSIONS | 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°    |

### RECOMMENDED LAND PATTERN



- 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.