

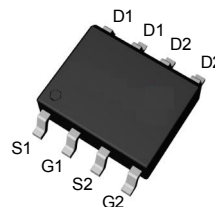
## Features

- -30V/-9.5A,  
 $R_{DS(ON)} = 15m\Omega(max.) @ V_{GS} = -10V$   
 $R_{DS(ON)} = 22m\Omega(max.) @ V_{GS} = -4.5V$
- Reliable and Rugged
- Lead Free and Green Devices Available  
(RoHS Compliant)

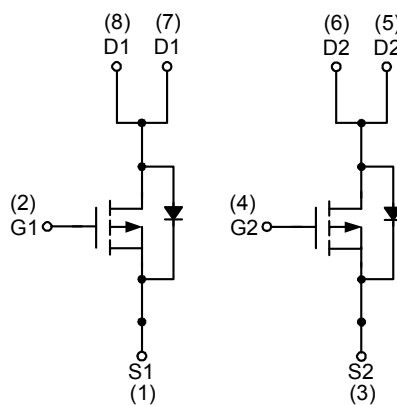
## Applications

- Power Management in Notebook Computer,  
Portable Equipment and Battery Powered  
Systems.

## Pin Description



Top View of SOP-8



P-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                   |                      | -30        | 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 | -1         | A    |
| I <sub>D</sub>               | Continuous Drain Current               | T <sub>A</sub> =25°C | -9.5       |      |
|                              |                                        | T <sub>A</sub> =70°C | -7.1       |      |
| I <sub>DM</sub> <sup>a</sup> | Pulsed Drain Current                   | T <sub>A</sub> =25°C | -35        |      |
| P <sub>D</sub>               | Maximum Power Dissipation              | T <sub>A</sub> =25°C | 2.5        | W    |
|                              |                                        | T <sub>A</sub> =70°C | 1.6        |      |
| R <sub>θJA</sub>             | Thermal Resistance-Junction to Ambient | t ≤ 10s              | 50         | °C/W |
|                              |                                        | Steady State         | 90         |      |
| 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              | 24         | A    |
|                              |                                        | L=0.5mH              | 14         |      |
| E <sub>AS</sub> <sup>b</sup> | Avalanche Energy, Single pulse         | L=0.1mH              | 29         | mJ   |
|                              |                                        | L=0.5mH              | 49         |      |

Note a : Pulse width is limited by maximum junction temperature.

Note b : UIS tested and pulse width are limited by maximum junction temperature  $150^\circ\text{C}$  (initial temperature  $T_i = 25^\circ\text{C}$ ).

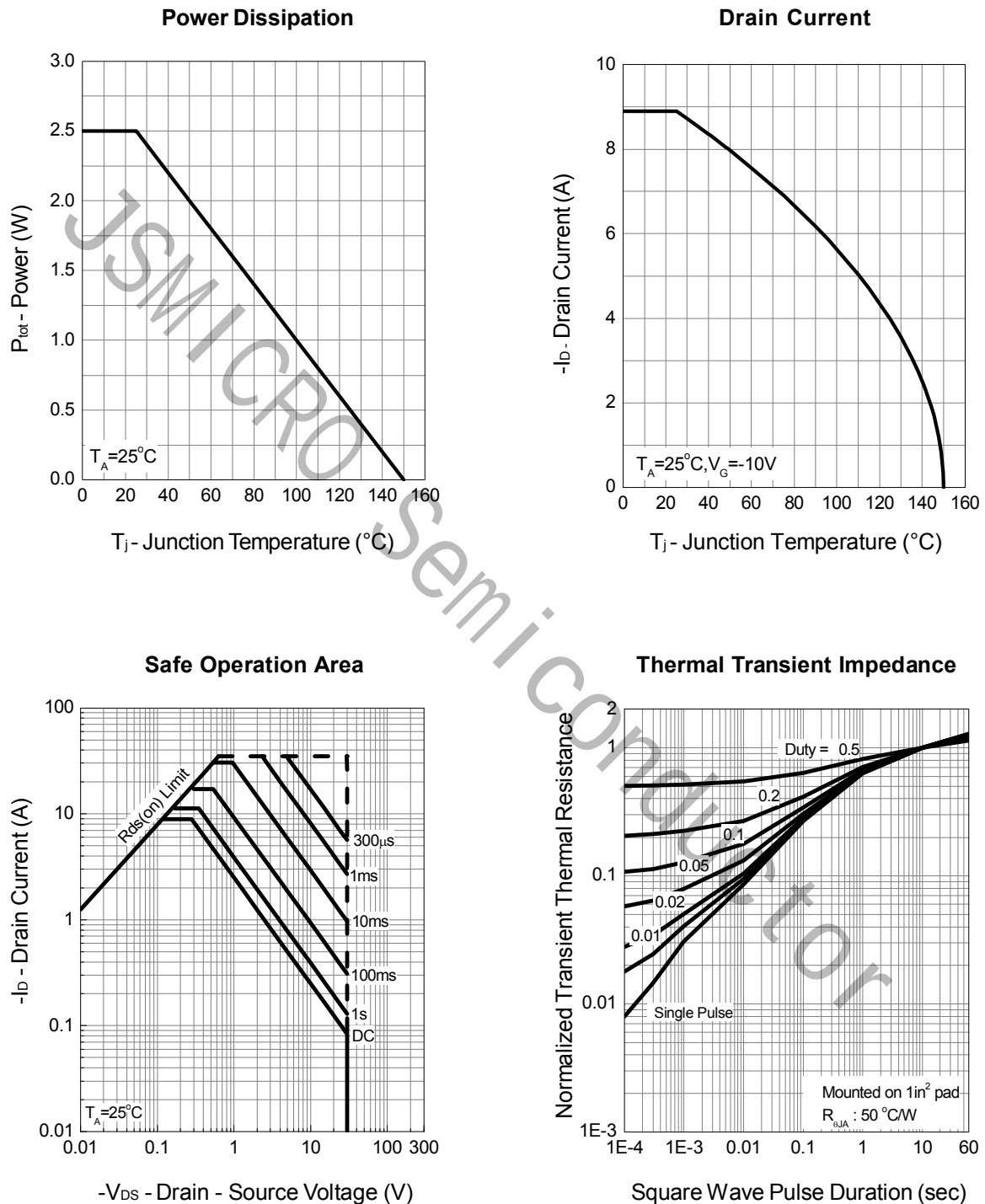
## Electrical Characteristics (T<sub>A</sub> = 25°C unless otherwise noted)

| 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                                                                       | -30    | -        | -         | V    |
| I <sub>DSS</sub>                         | Zero Gate Voltage Drain Current  | V <sub>DS</sub> =-24V, 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                                                         | -1.3   | -1.8     | -2.3      | V    |
| I <sub>GSS</sub>                         | Gate Leakage Current             | V <sub>GS</sub> =±25V, 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> =-8.9A<br>V <sub>GS</sub> =-4.5V, I <sub>DS</sub> =-5.6A                    | -<br>- | 15<br>22 | 21<br>30  | mΩ   |
| Diode Characteristics                    |                                  |                                                                                                                    |        |          |           |      |
| V <sub>SD</sub> <sup>c</sup>             | Diode Forward Voltage            | I <sub>SD</sub> =-1A, V <sub>GS</sub> =0V                                                                          | -      | -0.7     | -1        | V    |
| t <sub>rr</sub> <sup>d</sup>             | Reverse Recovery Time            | I <sub>SD</sub> =-8.9A,                                                                                            | -      | 18       | -         | ns   |
| Q <sub>rr</sub> <sup>d</sup>             | Reverse Recovery Charge          | dI <sub>SD</sub> /dt=100A/μs                                                                                       | -      | 9        | -         | nC   |
| Dynamic Characteristics <sup>d</sup>     |                                  |                                                                                                                    |        |          |           |      |
| R <sub>G</sub>                           | Gate Resistance                  | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, F=1MHz                                                                   | -      | 3.6      | -         | Ω    |
| C <sub>iss</sub>                         | Input Capacitance                | V <sub>GS</sub> =0V,                                                                                               | -      | 1004     | -         | pF   |
| C <sub>oss</sub>                         | Output Capacitance               | V <sub>DS</sub> =-15V,                                                                                             | -      | 204      | -         |      |
| C <sub>rss</sub>                         | Reverse Transfer Capacitance     | Frequency=1.0MHz                                                                                                   | -      | 154      | -         |      |
| t <sub>d(ON)</sub>                       | Turn-on Delay Time               | V <sub>DD</sub> =-15V, R <sub>L</sub> =15Ω,<br>I <sub>DS</sub> =-1A, V <sub>GEN</sub> =-10V,<br>R <sub>G</sub> =6Ω | -      | 8.8      | -         | ns   |
| t <sub>r</sub>                           | Turn-on Rise Time                |                                                                                                                    | -      | 10.4     | -         |      |
| t <sub>d(OFF)</sub>                      | Turn-off Delay Time              |                                                                                                                    | -      | 35.2     | -         |      |
| t <sub>f</sub>                           | Turn-off Fall Time               |                                                                                                                    | -      | 46.8     | -         |      |
| Gate Charge Characteristics <sup>d</sup> |                                  |                                                                                                                    |        |          |           |      |
| Q <sub>g</sub>                           | Total Gate Charge                | V <sub>DS</sub> =-15V, V <sub>GS</sub> =-10V,<br>I <sub>DS</sub> =-8.9A                                            | -      | 20       | -         | nC   |
|                                          | Total Gate Charge                |                                                                                                                    | -      | 10       | -         |      |
| Q <sub>gs</sub>                          | Gate-Source Charge               | V <sub>DS</sub> =-15V, V <sub>GS</sub> =-4.5V,                                                                     | -      | 3.8      | -         |      |
| Q <sub>gd</sub>                          | Gate-Drain Charge                | I <sub>DS</sub> =-8.9A                                                                                             | -      | 5.7      | -         |      |
| Q <sub>gth</sub>                         | Threshold Gate Charge            |                                                                                                                    | -      | 1        | -         |      |

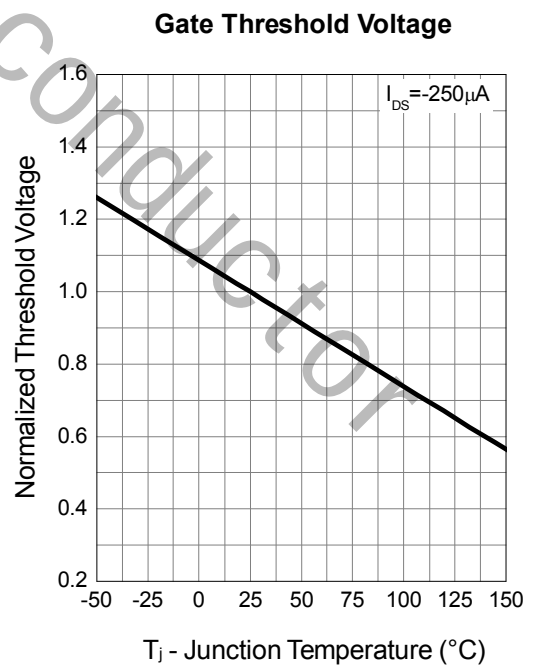
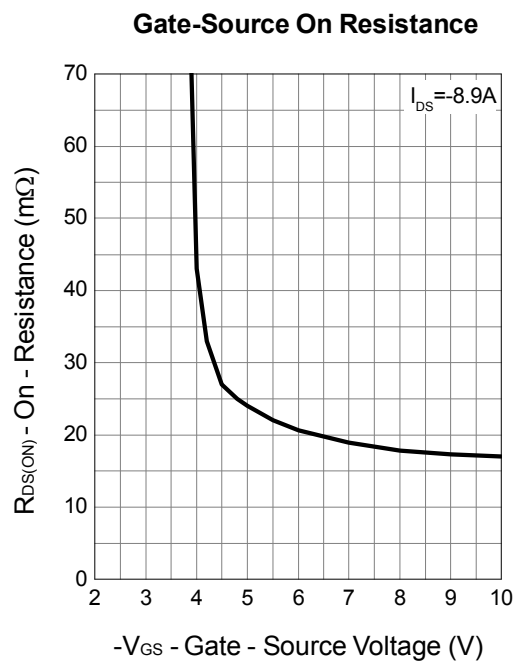
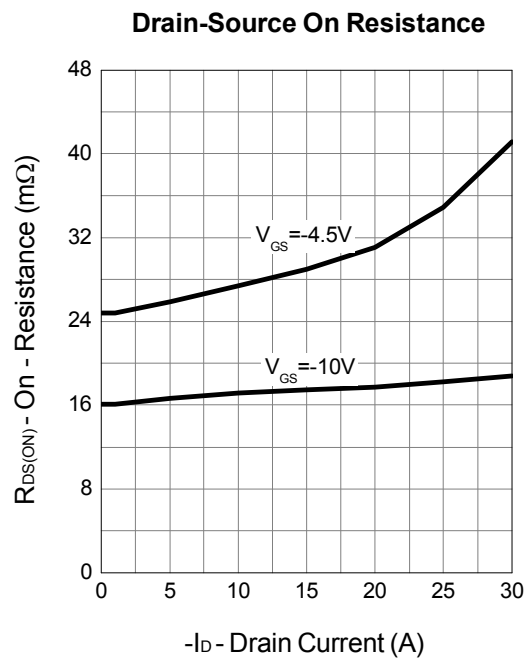
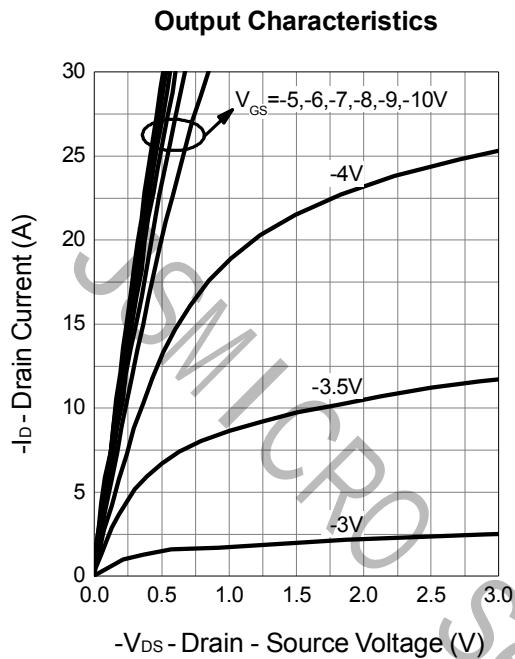
Note c : Pulse test; pulse width≤300μs, duty cycle≤2%.

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

## Typical Operating Characteristics

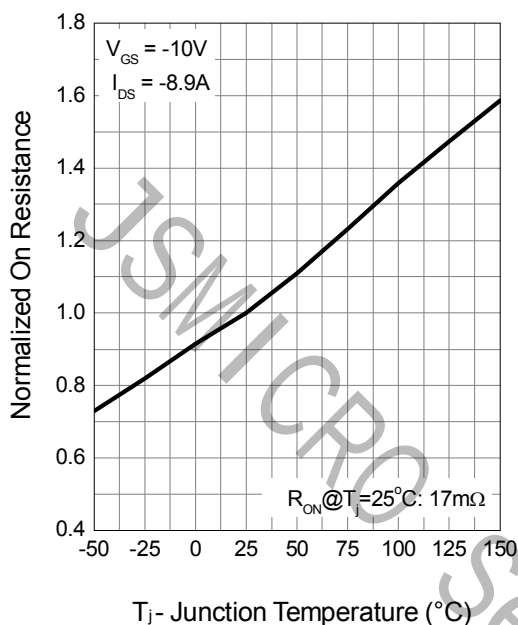


## Typical Operating Characteristics (Cont.)

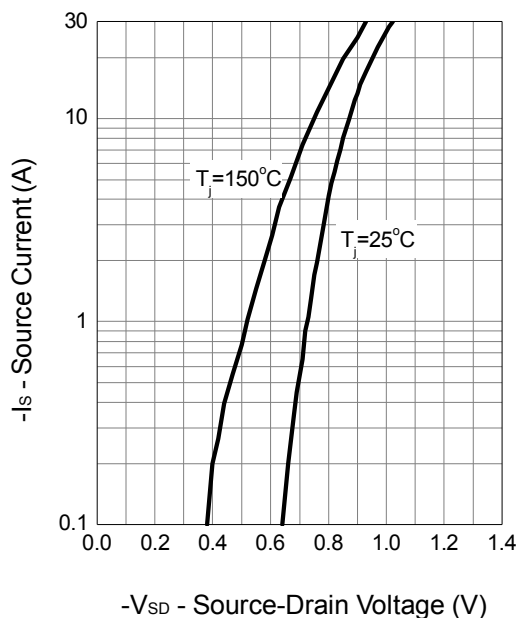


## Typical Operating Characteristics (Cont.)

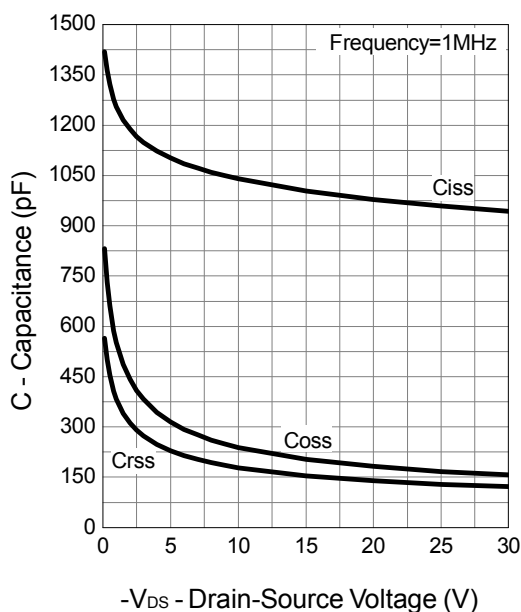
Drain-Source On Resistance



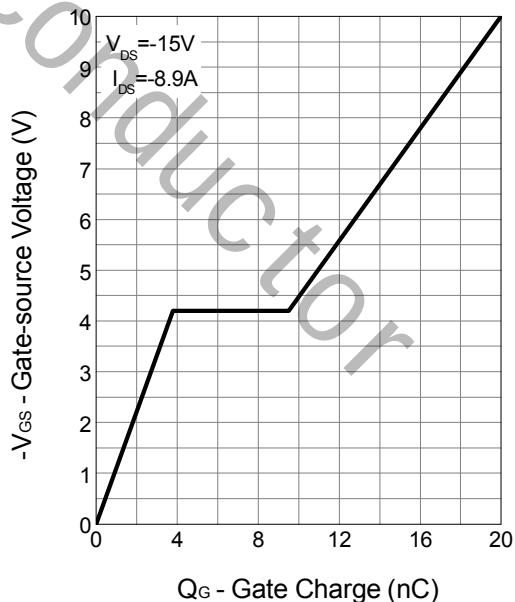
Source-Drain Diode Forward



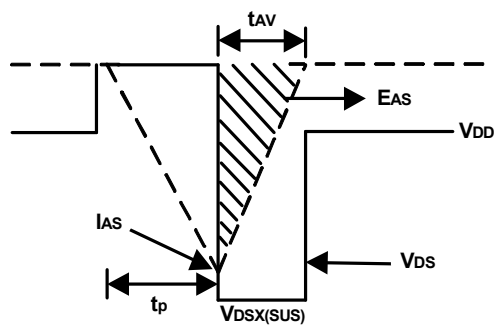
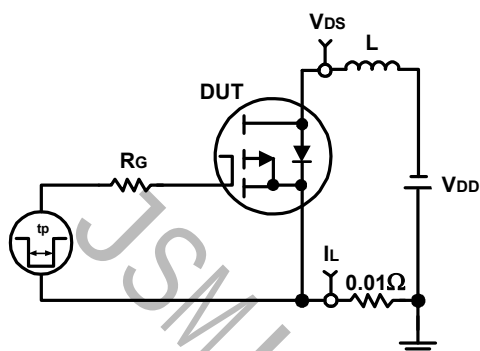
Capacitance



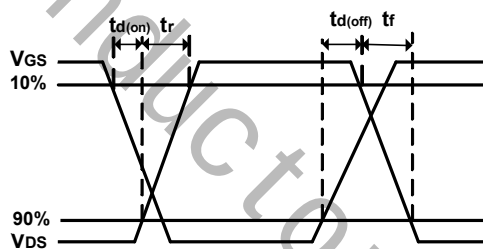
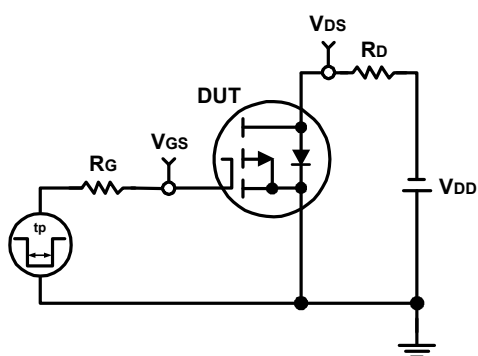
Gate Charge



## Avalanche Test Circuit and Waveforms

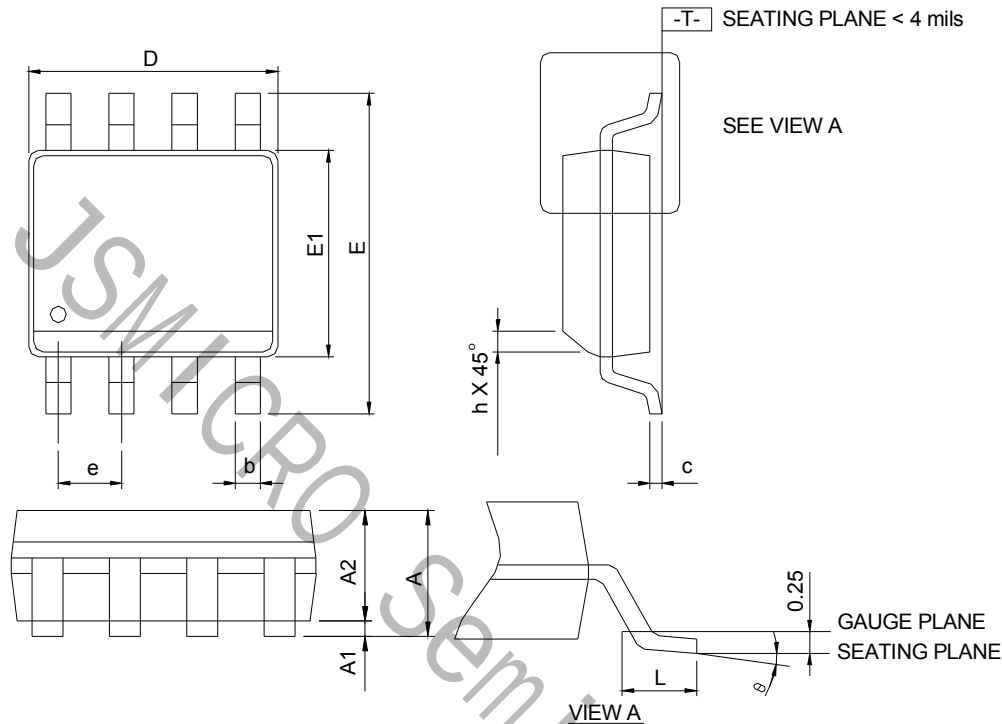


## Switching Time Test Circuit and Waveforms



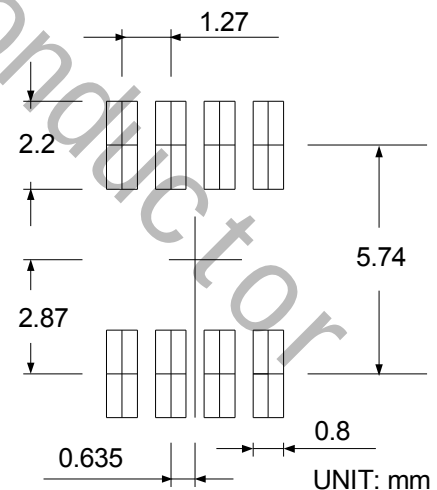
## Package Information

### SOP-8



| SOP-8 | 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.