

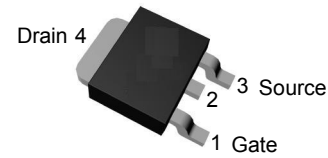
## Features

- 120V/90A  
 $R_{DS(ON)}=9m\Omega(\text{typ.})@V_{GS}=10V$
- 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)

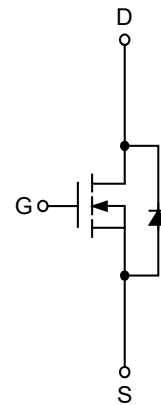
## Applications

- Synchronous Rectification.
- Charger for Mobile Devices.
- USB-PD Adaptors.

## Pin Description



TO-252



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                   |                       | 120        | 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  | 90         | A    |
| I <sub>D</sub>                | Continuous Drain Current               | T <sub>C</sub> =25°C  | 90         | A    |
|                               |                                        | T <sub>C</sub> =100°C | 68         |      |
| I <sub>DM</sub> <sup>a</sup>  | Pulsed Drain Current                   | T <sub>C</sub> =25°C  | 270        |      |
| P <sub>D</sub>                | Maximum Power Dissipation              | T <sub>C</sub> =25°C  | 150        | W    |
|                               |                                        | T <sub>C</sub> =100°C | 75         |      |
| R <sub>θJC</sub>              | Thermal Resistance-Junction to Case    |                       | 1          | °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               | 28         | A    |
| E <sub>AS</sub> <sup>b</sup>  | Avalanche Energy, Single pulse         | L=0.5mH               | 196        | mJ   |

Note a : Pulse width limited by maximum 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.

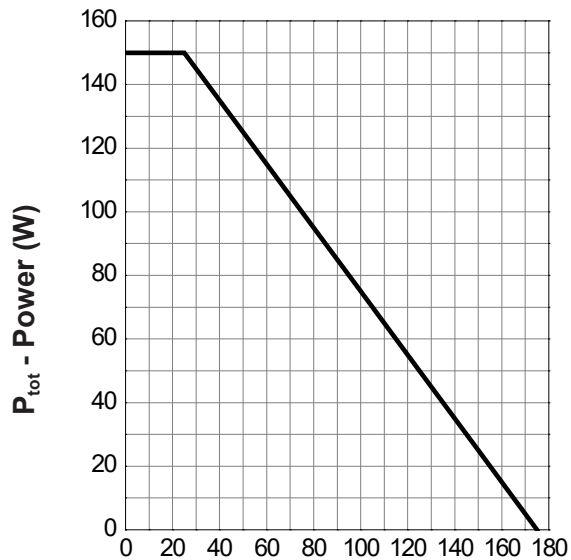
**Electrical Characteristics** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

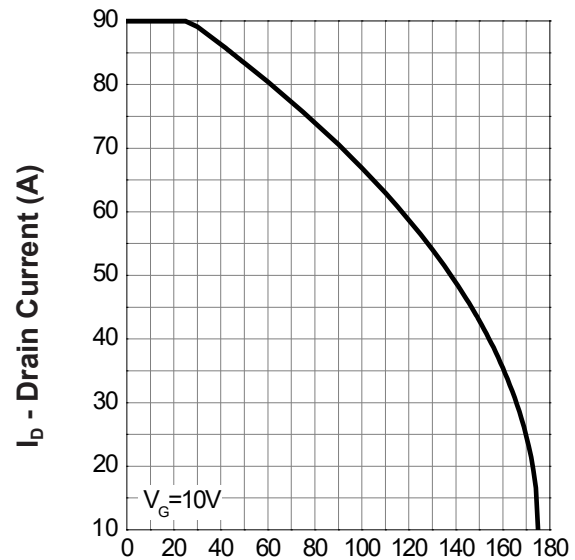
| Symbol                                   | Parameter                        | Test Conditions                                                                                                 | Min. | Typ. | Max. | Unit |
|------------------------------------------|----------------------------------|-----------------------------------------------------------------------------------------------------------------|------|------|------|------|
| Static Characteristics                   |                                  |                                                                                                                 |      |      |      |      |
| BV <sub>DSS</sub>                        | Drain-Source Breakdown Voltage   | V <sub>GS</sub> =0V, I <sub>DS</sub> =250μA                                                                     | 120  | -    | -    | V    |
| I <sub>DSS</sub>                         | Zero Gate Voltage Drain Current  | V <sub>DS</sub> =96V, 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                                                       | 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> =35A                                                                      | -    | 9    | 12   | mΩ   |
| Diode Characteristics                    |                                  |                                                                                                                 |      |      |      |      |
| V <sub>SD</sub> <sup>d</sup>             | Diode Forward Voltage            | I <sub>SD</sub> =20A, V <sub>GS</sub> =0V                                                                       | -    | 0.8  | 1.1  | V    |
| t <sub>rr</sub>                          | Reverse Recovery Time            | I <sub>SD</sub> =35A, dI <sub>SD</sub> /dt=100A/μs                                                              | -    | 57   | -    | ns   |
| Q <sub>rr</sub>                          | Reverse Recovery Charge          |                                                                                                                 | -    | 147  | -    | nC   |
| Dynamic Characteristics <sup>e</sup>     |                                  |                                                                                                                 |      |      |      |      |
| R <sub>G</sub>                           | Gate Resistance                  | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, F=1MHz                                                                | -    | 1.5  | -    | Ω    |
| C <sub>iss</sub>                         | Input Capacitance                | V <sub>GS</sub> =0V,<br>V <sub>DS</sub> =60V,<br>Frequency=1.0MHz                                               | -    | 2125 | 3280 | pF   |
| C <sub>oss</sub>                         | Output Capacitance               |                                                                                                                 | -    | 855  | -    |      |
| C <sub>rss</sub>                         | Reverse Transfer Capacitance     |                                                                                                                 | -    | 25   | -    |      |
| 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 | -    | 21   | 37   | ns   |
| t <sub>r</sub>                           | Turn-on Rise Time                |                                                                                                                 | -    | 9    | 16   |      |
| t <sub>d(OFF)</sub>                      | Turn-off Delay Time              |                                                                                                                 | -    | 45   | 80   |      |
| t <sub>f</sub>                           | Turn-off Fall Time               |                                                                                                                 | -    | 74   | 133  |      |
| Gate Charge Characteristics <sup>e</sup> |                                  |                                                                                                                 |      |      |      |      |
| Q <sub>g</sub>                           | Total Gate Charge                | V <sub>DS</sub> =60V, V <sub>GS</sub> =10V,<br>I <sub>DS</sub> =35A                                             | -    | 39   | 55   | nC   |
| Q <sub>gs</sub>                          | Gate-Source Charge               |                                                                                                                 | -    | 12   | -    |      |
| Q <sub>gd</sub>                          | Gate-Drain Charge                |                                                                                                                 | -    | 8    | -    |      |

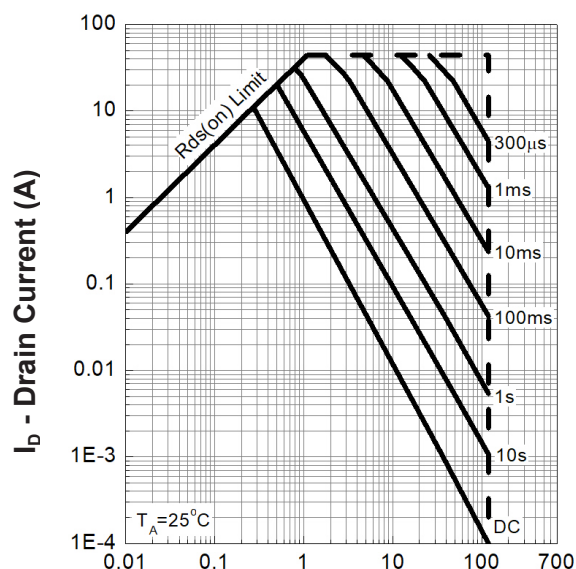
Note d : Pulse test ; pulse width $\leq 300\mu s$ , duty cycle $\leq 2\%$ .

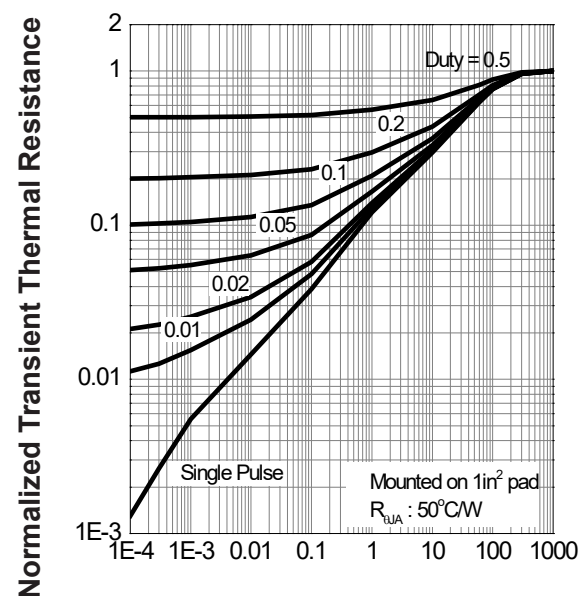
Note e : Guaranteed by design, not subject to production testing.

## Typical Operating Characteristics

**Power Dissipation**

 $T_c$  - Case Temperature ( $^{\circ}\text{C}$ )

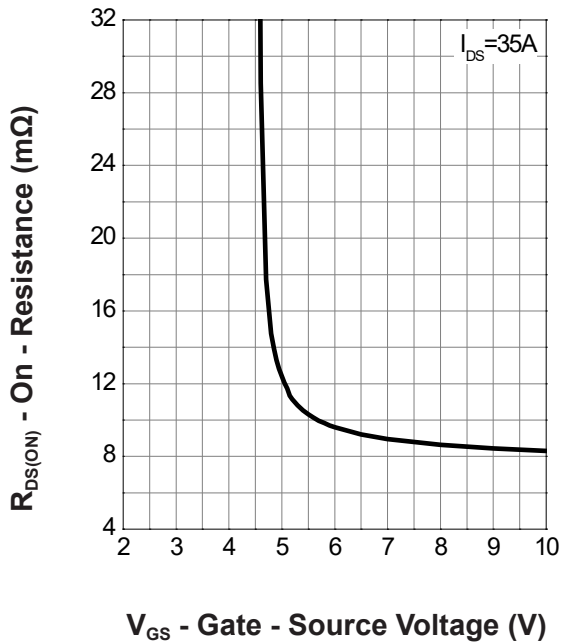
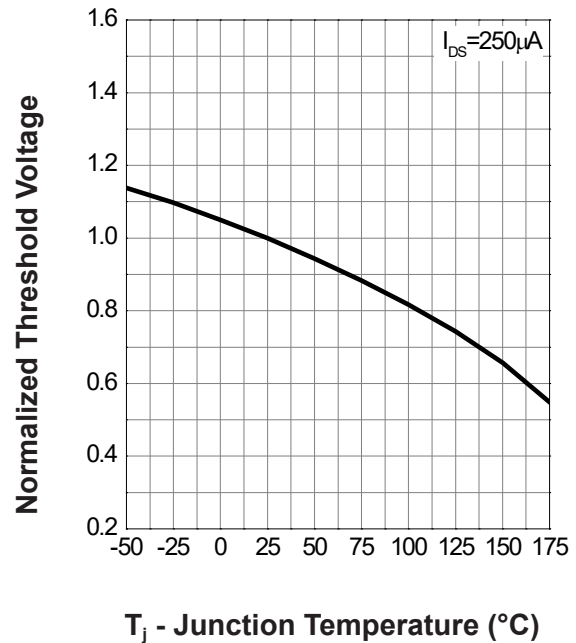
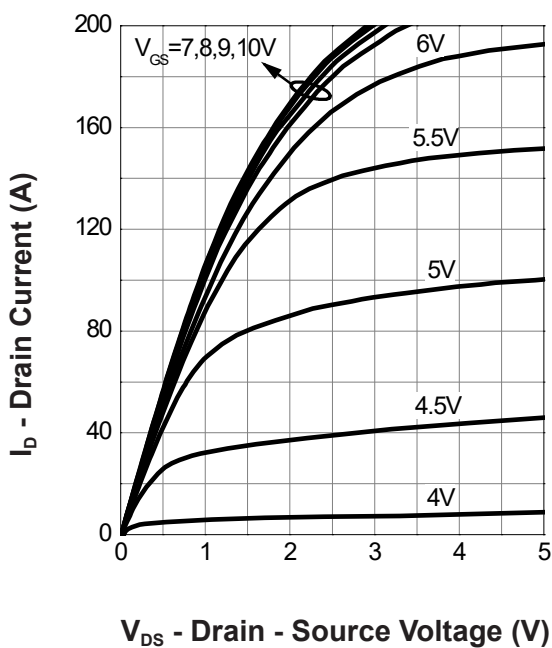
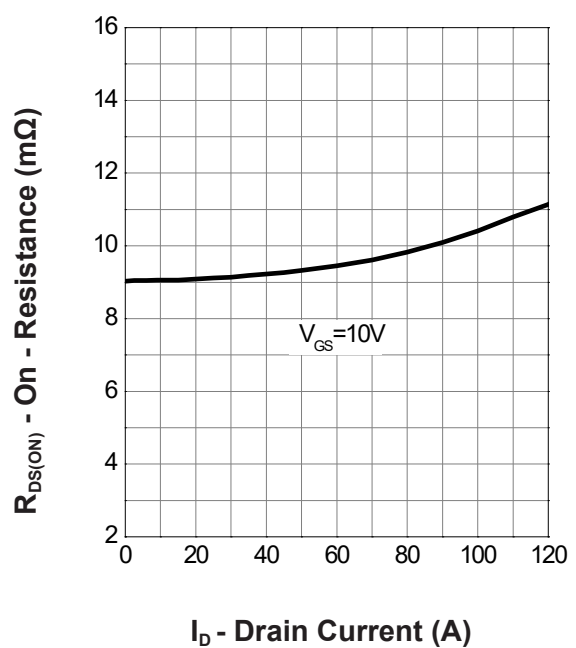
**Drain Current**

 $T_c$  - Case Temperature ( $^{\circ}\text{C}$ )

**Safe Operation Area**

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

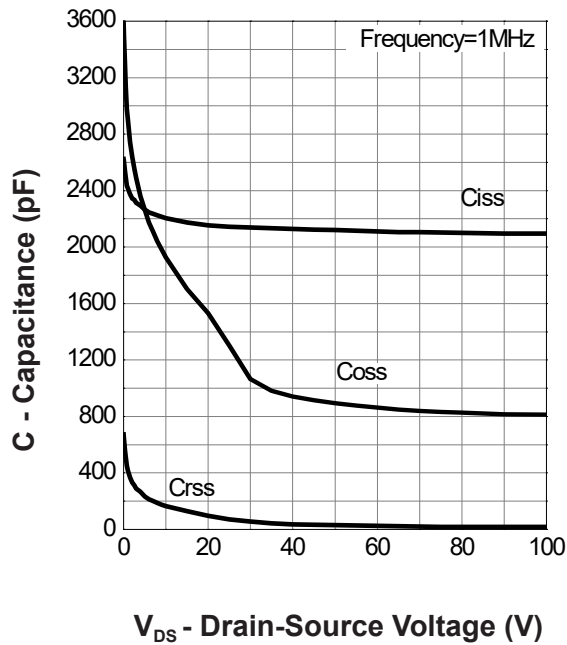
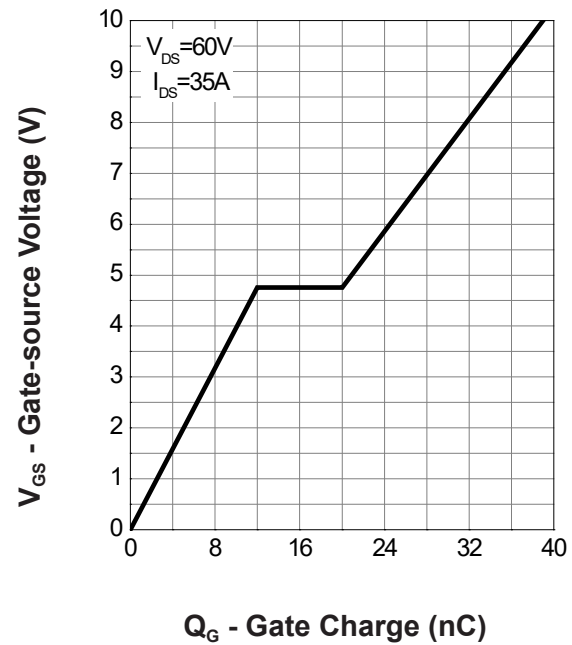
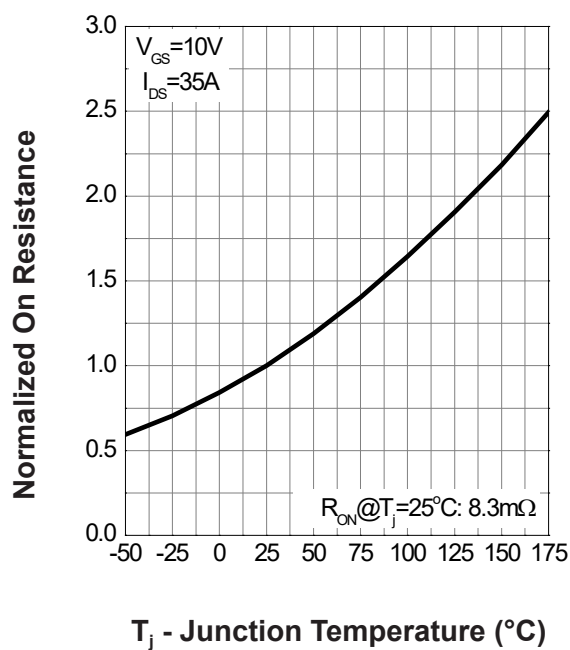
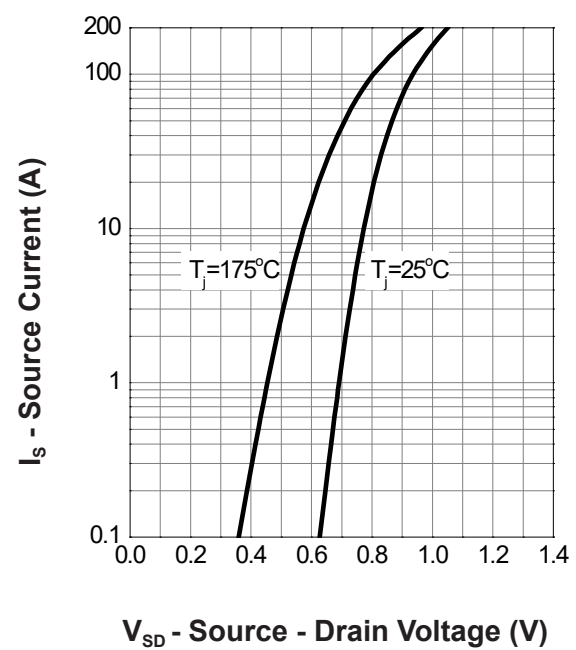
**Thermal Transient Impedance**


Square Wave Pulse Duration (sec)

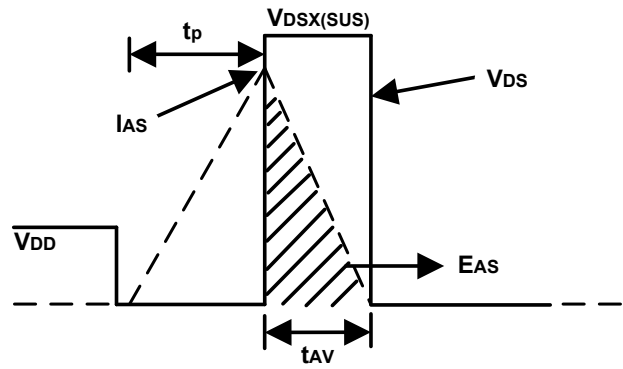
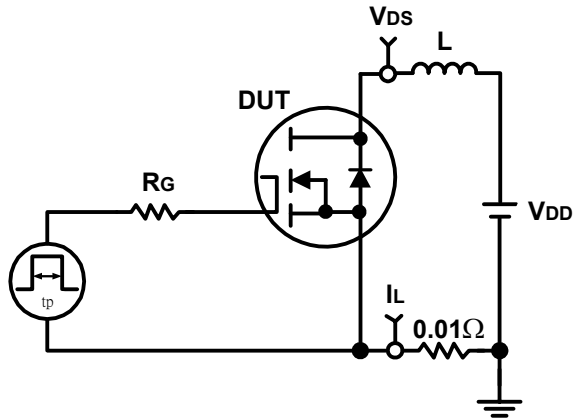
## Typical Operating Characteristics(Cont.)

**Gate-Source On Resistance**

**Gate Threshold Voltage**

**Output Characteristics**

**Drain-Source On Resistance**


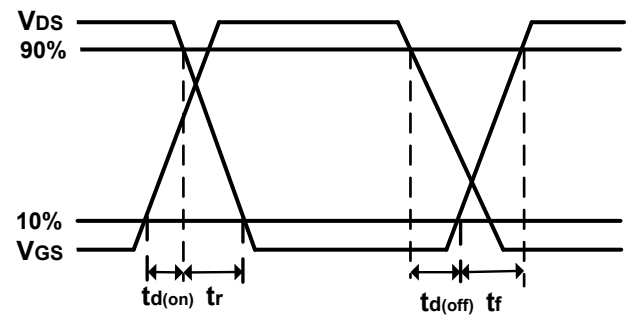
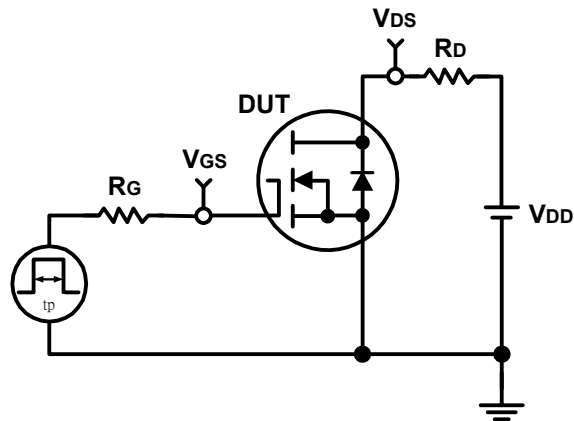
## Typical Operating Characteristics(Cont.)

**Capacitance**

**Gate Charge**

**Drain-Source On Resistance**

**Source-Drain Diode Forward**


## Avalanche Test Circuit and Waveforms

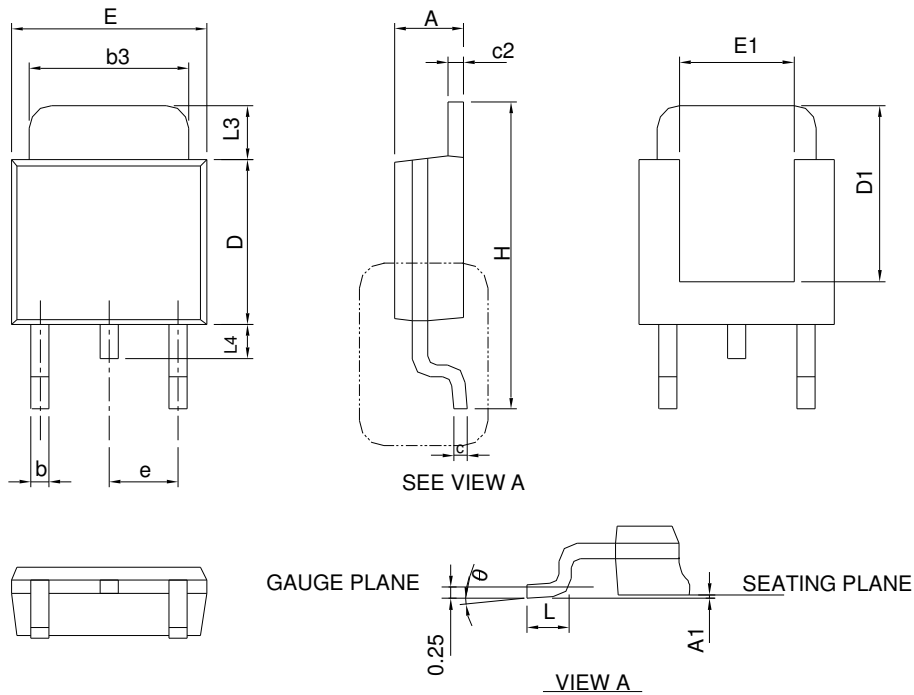


## Switching Time Test Circuit and Waveforms



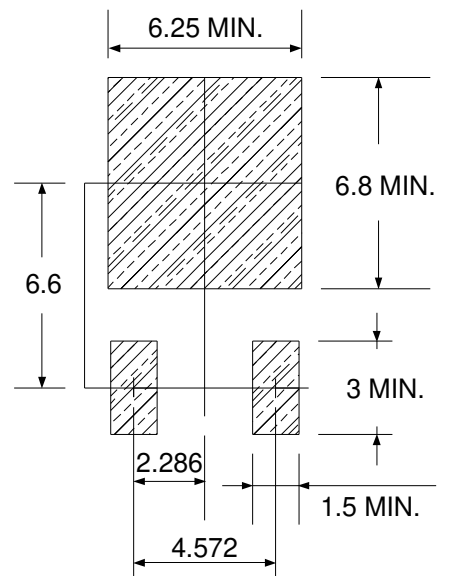
## Package Information

TO-252



| SYMBOL | TO-252      |       |           |       |
|--------|-------------|-------|-----------|-------|
|        | MILLIMETERS |       | INCHES    |       |
|        | MIN.        | MAX.  | MIN.      | MAX.  |
| A      | 2.18        | 2.39  | 0.086     | 0.094 |
| A1     | -           | 0.13  | -         | 0.005 |
| b      | 0.50        | 0.89  | 0.020     | 0.035 |
| b3     | 4.95        | 5.46  | 0.195     | 0.215 |
| c      | 0.46        | 0.61  | 0.018     | 0.024 |
| c2     | 0.46        | 0.89  | 0.018     | 0.035 |
| D      | 5.33        | 6.22  | 0.210     | 0.245 |
| D1     | 4.57        | 6.00  | 0.180     | 0.236 |
| E      | 6.35        | 6.73  | 0.250     | 0.265 |
| E1     | 3.81        | 6.00  | 0.150     | 0.236 |
| e      | 2.29 BSC    |       | 0.090 BSC |       |
| H      | 9.40        | 10.41 | 0.370     | 0.410 |
| L      | 0.90        | 1.78  | 0.035     | 0.070 |
| L3     | 0.89        | 2.03  | 0.035     | 0.080 |
| L4     | -           | 1.02  | -         | 0.040 |
| θ      | 0°          | 8°    | 0°        | 8°    |

### RECOMMENDED LAND PATTERN



UNIT: mm

Note : Follow JEDEC TO-252 .