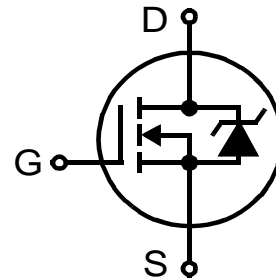


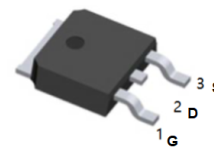
**Description**

This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low  $r_{DS(ON)}$  and fast switching speed.



**Features**

- $V_{DS}$  (V) = 30V
- $I_D$  = 35A ( $V_{GS}$  = 10V)
- $R_{DS(ON)}$  = 5.7m $\Omega$  ( $V_{GS}$  = 10V)
- $R_{DS(ON)}$  = 6.8m $\Omega$  ( $V_{GS}$  = 4.5V)



TO-252(DPAK) top view

**MOSFET Maximum Ratings**  $T_C = 25^\circ\text{C}$  unless otherwise noted

| Symbol         | Parameter   | Ratings    | Units               |
|----------------|---|------------|---------------------|
| $V_{DSS}$      | Drain to Source Voltage   | 30         | V                   |
| $V_{GS}$       | Gate to Source Voltage  | $\pm 20$   | V                   |
| $I_D$          | Drain Current   |            |                     |
|                | Continuous ( $T_C = 25^\circ\text{C}$ , $V_{GS} = 10\text{V}$ ) (Note 1)  | 94         | A                   |
|                | Continuous ( $T_C = 25^\circ\text{C}$ , $V_{GS} = 4.5\text{V}$ ) (Note 1)                                       | 85         | A                   |
|                | Continuous ( $T_{amb} = 25^\circ\text{C}$ , $V_{GS} = 10\text{V}$ , with $R_{\theta JA} = 52^\circ\text{C/W}$ ) | 17         | A                   |
|                | Pulsed  | Figure 4   | A                   |
| $E_{AS}$       | Single Pulse Avalanche Energy (Note 2)  | 168        | mJ                  |
| $P_D$          | Power dissipation   | 80         | W                   |
|                | Derate above $25^\circ\text{C}$   | 0.53       | W/ $^\circ\text{C}$ |
| $T_J, T_{STG}$ | Operating and Storage Temperature   | -55 to 175 | $^\circ\text{C}$    |

**Thermal Characteristics**

|                 |   |      |                    |
|-----------------|---|------|--------------------|
| $R_{\theta JC}$ | Thermal Resistance Junction to Case TO-252                                      | 1.88 | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Thermal Resistance Junction to Ambient TO-252                                   | 100  | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Thermal Resistance Junction to Ambient TO-252, 1in <sup>2</sup> copper pad area | 52   | $^\circ\text{C/W}$ |

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

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|--------|-----------|-----------------|-----|-----|-----|-------|
|--------|-----------|-----------------|-----|-----|-----|-------|

**Off Characteristics**

|            |                                   |   |    |   |           |               |
|------------|-----------------------------------|---|----|---|-----------|---------------|
| $B_{VDSS}$ | Drain to Source Breakdown Voltage | $I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$    | 30 | - | -         | V             |
| $I_{DSS}$  | Zero Gate Voltage Drain Current   | $V_{DS} = 24\text{V}$<br>$V_{GS} = 0\text{V}$ | -  | - | 1         | $\mu\text{A}$ |
|            |                                   | $T_C = 150^\circ\text{C}$                     | -  | - | 250       |               |
| $I_{GSS}$  | Gate to Source Leakage Current    | $V_{GS} = \pm 20\text{V}$                     | -  | - | $\pm 100$ | nA            |

**On Characteristics**

|              |                                  |   |     |    |     |                  |
|--------------|----------------------------------|---|-----|----|-----|------------------|
| $V_{GS(TH)}$ | Gate to Source Threshold Voltage | $V_{GS} = V_{DS}, I_D = 250\mu\text{A}$                               | 1.2 | -  | 2.5 | V                |
| $r_{DS(ON)}$ | Drain to Source On Resistance    | $I_D = 35\text{A}, V_{GS} = 10\text{V}$                               | -   | 47 | 57  | $\text{m}\Omega$ |
|              |                                  | $I_D = 35\text{A}, V_{GS} = 4.5\text{V}$                              | -   | 57 | 68  |                  |
|              |                                  | $I_D = 35\text{A}, V_{GS} = 10\text{V},$<br>$T_J = 175^\circ\text{C}$ | -   | 75 | 92  |                  |

**Dynamic Characteristics**

|              |                                  |   |   |      |     |          |    |
|--------------|----------------------------------|---|---|------|-----|----------|----|
| $C_{ISS}$    | Input Capacitance                | $V_{DS} = 15\text{V}, V_{GS} = 0\text{V},$<br>$f = 1\text{MHz}$ | -   | 2525 | -   | pF       |    |
| $C_{OSS}$    | Output Capacitance               |   | -   | 490  | -   | pF       |    |
| $C_{RSS}$    | Reverse Transfer Capacitance     |   | -   | 300  | -   | pF       |    |
| $R_G$        | Gate Resistance                  | $V_{GS} = 0.5\text{V}, f = 1\text{MHz}$                         | -   | 2.1  | -   | $\Omega$ |    |
| $Q_{g(TOT)}$ | Total Gate Charge at 10V         | $V_{GS} = 0\text{V to } 10\text{V}$                             | $V_{DD} = 15\text{V}$<br>$I_D = 35\text{A}$<br>$I_g = 1.0\text{mA}$ | -    | 46  | 60       | nC |
| $Q_{g(5)}$   | Total Gate Charge at 5V          | $V_{GS} = 0\text{V to } 5\text{V}$                              |   | -    | 24  | 32       | nC |
| $Q_{g(TH)}$  | Threshold Gate Charge            | $V_{GS} = 0\text{V to } 1\text{V}$                              |   | -    | 2.3 | 3.0      | nC |
| $Q_{gs}$     | Gate to Source Gate Charge       |   |   | -    | 6.9 | -        | nC |
| $Q_{gs2}$    | Gate Charge Threshold to Plateau |   |   | -    | 4.6 | -        | nC |
| $Q_{gd}$     | Gate to Drain "Miller" Charge    |   |   | -    | 9.8 | -        | nC |

**Switching Characteristics** ( $V_{GS} = 10\text{V}$ )

|              |                     |  |   |     |     |    |
|--------------|---------------------|--|---|-----|-----|----|
| $t_{ON}$     | Turn-On Time        | $V_{DD} = 15\text{V}, I_D = 35\text{A}$<br>$V_{GS} = 10\text{V}, R_{GS} = 6.2\Omega$ | - | -   | 171 | ns |
| $t_{d(ON)}$  | Turn-On Delay Time  |  | - | 9   | -   | ns |
| $t_r$        | Rise Time           |  | - | 106 | -   | ns |
| $t_{d(OFF)}$ | Turn-Off Delay Time |  | - | 53  | -   | ns |
| $t_f$        | Fall Time           |  | - | 41  | -   | ns |
| $t_{OFF}$    | Turn-Off Time       |  | - | -   | 143 | ns |

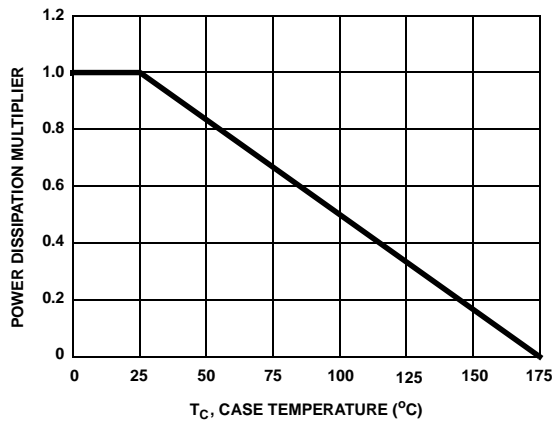
**Drain-Source Diode Characteristics**

|          |                               |   |   |   |      |    |
|----------|-------------------------------|---|---|---|------|----|
| $V_{SD}$ | Source to Drain Diode Voltage | $I_{SD} = 35\text{A}$                                       | - | - | 1.25 | V  |
|          |                               | $I_{SD} = 15\text{A}$                                       | - | - | 1.0  | V  |
| $t_{rr}$ | Reverse Recovery Time         | $I_{SD} = 35\text{A}, di_{SD}/dt = 100\text{A}/\mu\text{s}$ | - | - | 27   | ns |
| $Q_{RR}$ | Reverse Recovered Charge      | $I_{SD} = 35\text{A}, di_{SD}/dt = 100\text{A}/\mu\text{s}$ | - | - | 12   | nC |

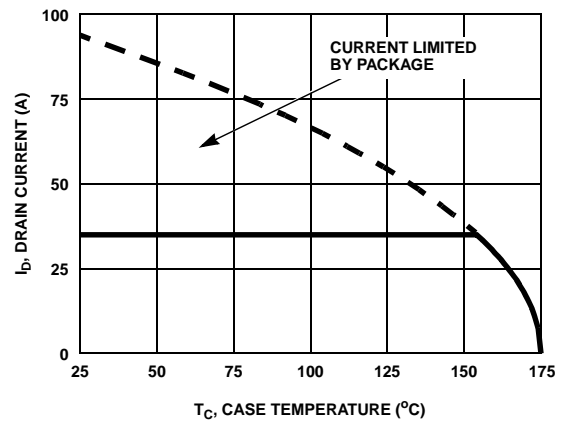
**Notes:**

- 1: Package current limitation is 35A.
- 2: Starting  $T_J = 25^\circ\text{C}$ ,  $L = 0.43\text{mH}$ ,  $I_{AS} = 28\text{A}$ ,  $V_{DD} = 27\text{V}$ ,  $V_{GS} = 10\text{V}$ .

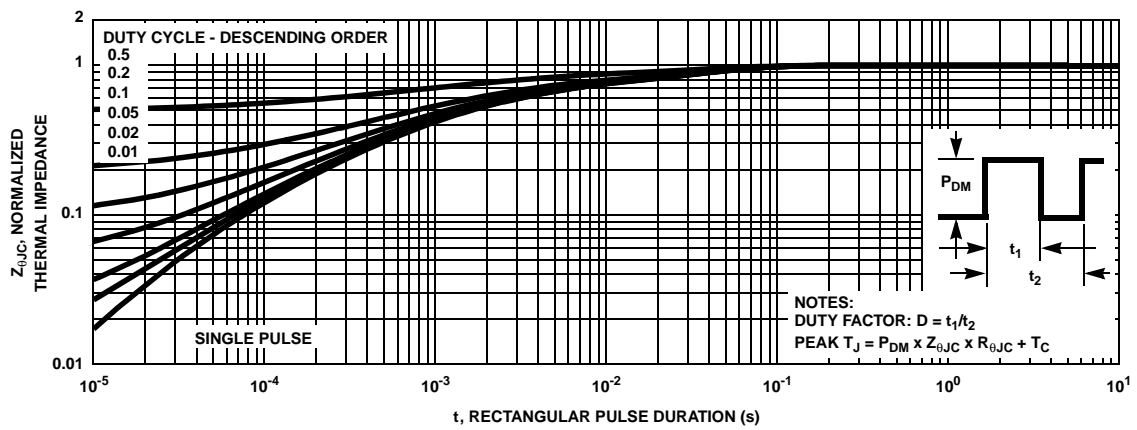
**Typical Characteristics**  $T_C = 25^\circ\text{C}$  unless otherwise noted



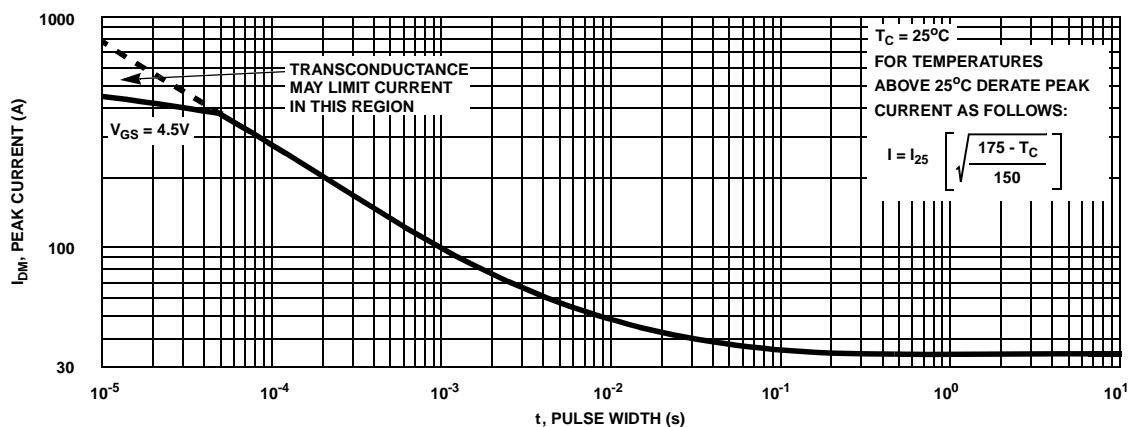
**Figure 1. Normalized Power Dissipation vs Case Temperature**



**Figure 2. Maximum Continuous Drain Current vs Case Temperature**

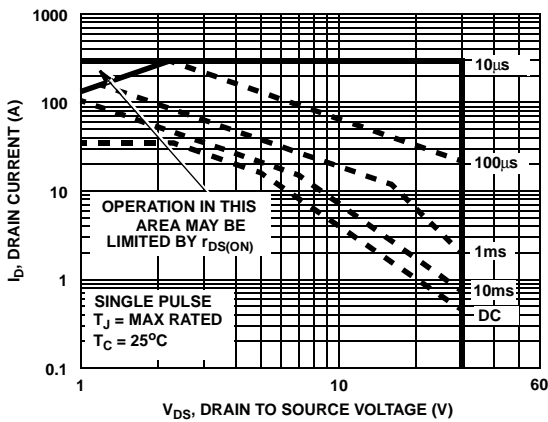


**Figure 3. Normalized Maximum Transient Thermal Impedance**

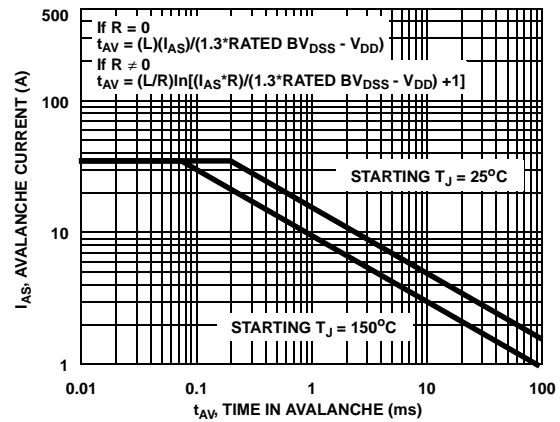


**Figure 4. Peak Current Capability**

**Typical Characteristics**  $T_C = 25^\circ\text{C}$  unless otherwise noted

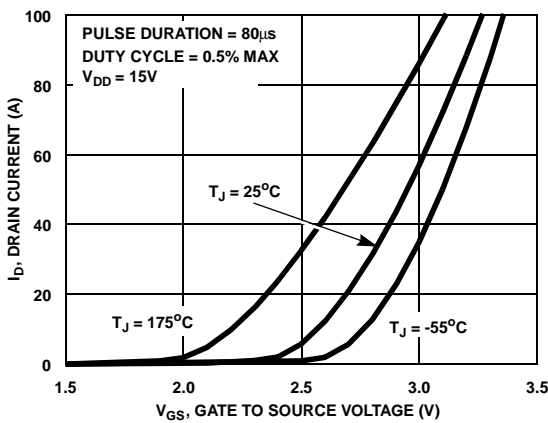


**Figure 5. Forward Bias Safe Operating Area**

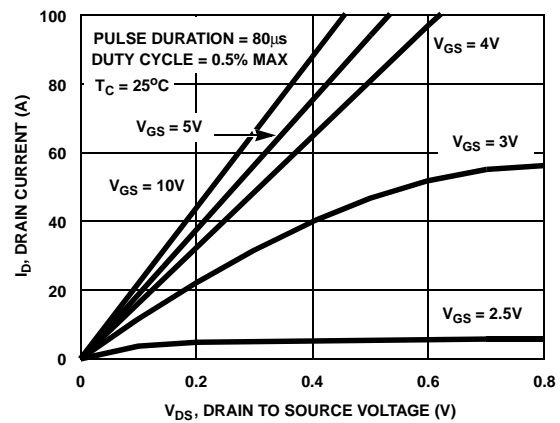


NOTE: Refer to Fairchild Application Notes AN7514 and AN7515

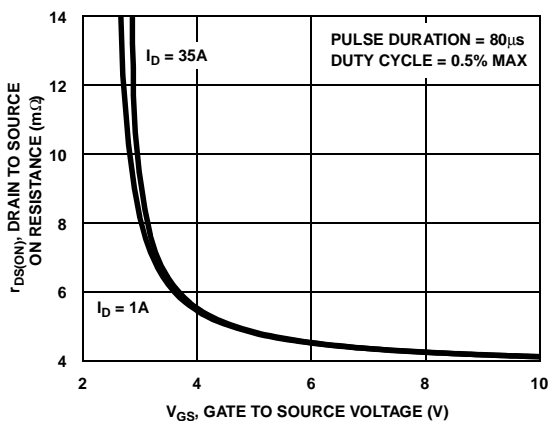
**Figure 6. Unclamped Inductive Switching Capability**



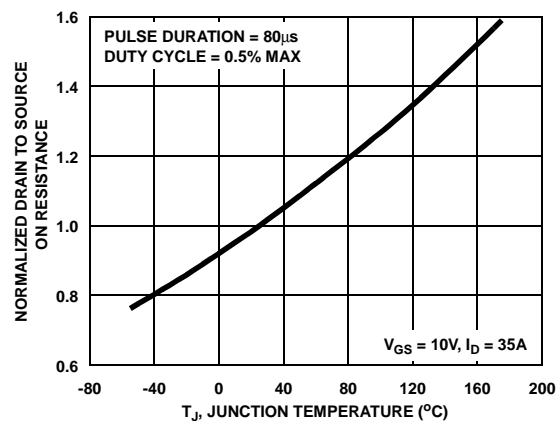
**Figure 7. Transfer Characteristics**



**Figure 8. Saturation Characteristics**

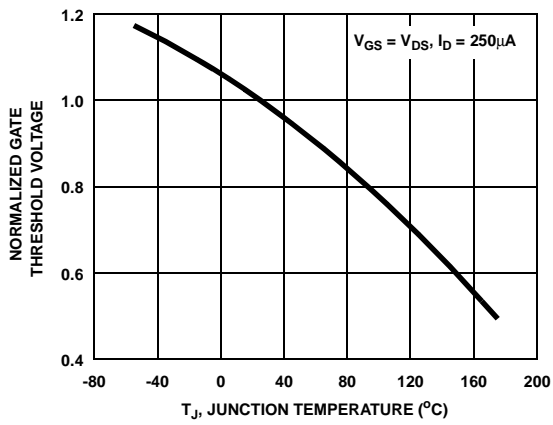


**Figure 9. Drain to Source On Resistance vs Gate Voltage and Drain Current**

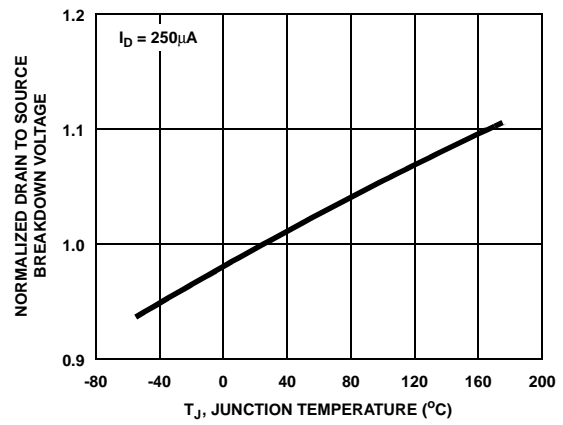


**Figure 10. Normalized Drain to Source On Resistance vs Junction Temperature**

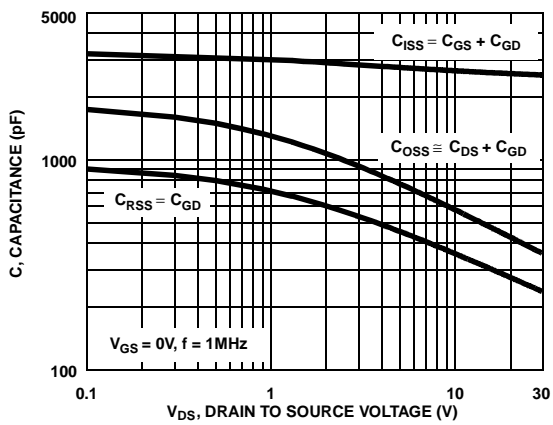
**Typical Characteristics**  $T_C = 25^\circ\text{C}$  unless otherwise noted



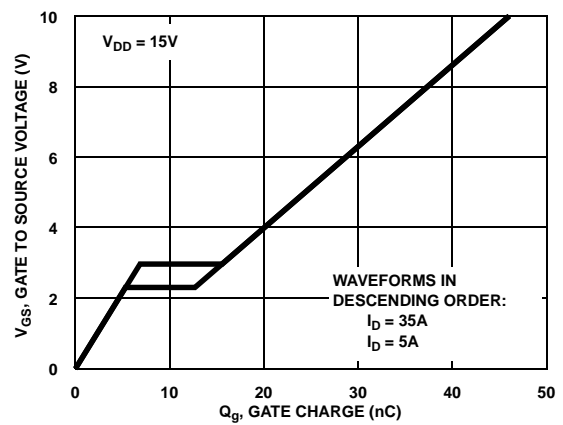
**Figure 11. Normalized Gate Threshold Voltage vs Junction Temperature**



**Figure 12. Normalized Drain to Source Breakdown Voltage vs Junction Temperature**

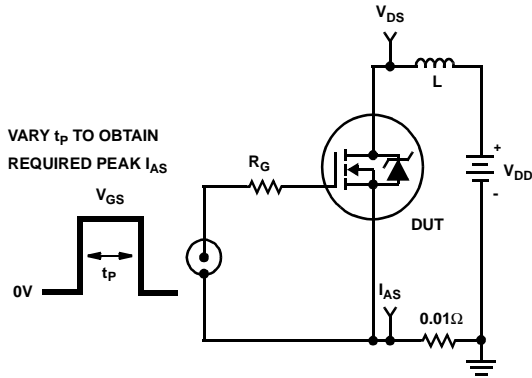


**Figure 13. Capacitance vs Drain to Source Voltage**

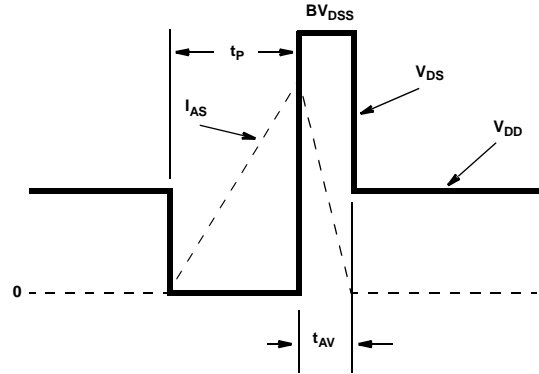


**Figure 14. Gate Charge Waveforms for Constant Gate Current**

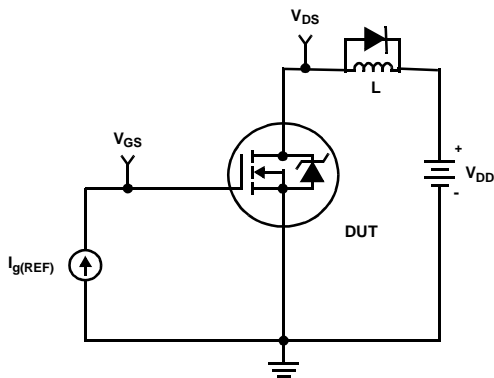
**Test Circuits and Waveforms**



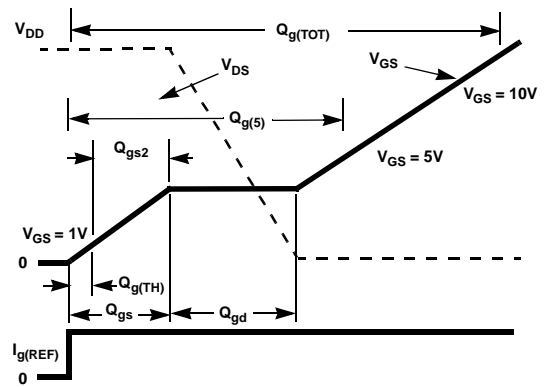
**Figure 15. Unclamped Energy Test Circuit**



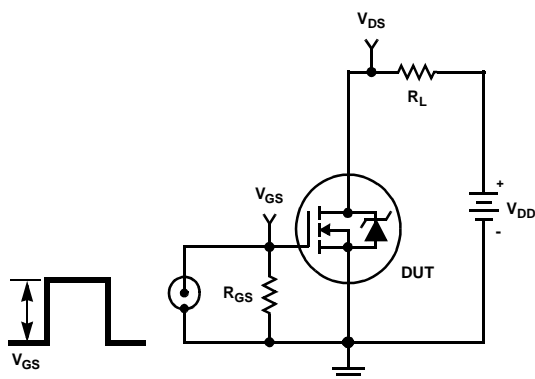
**Figure 16. Unclamped Energy Waveforms**



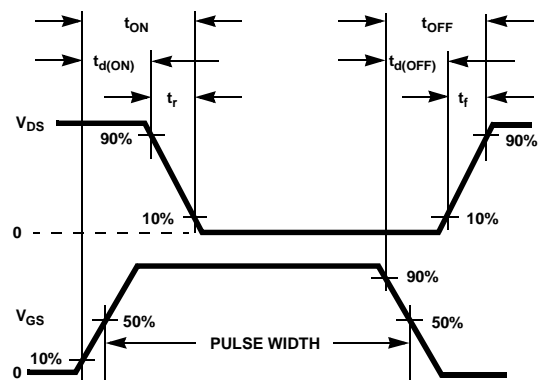
**Figure 17. Gate Charge Test Circuit**



**Figure 18. Gate Charge Waveforms**

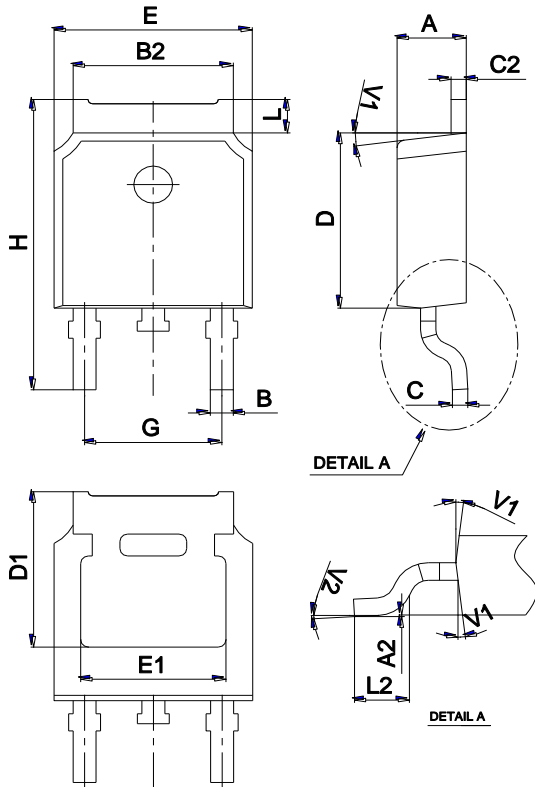


**Figure 19. Switching Time Test Circuit**



**Figure 20. Switching Time Waveforms**

**Package Mechanical Data TO-252**



| Ref. | Dimensions  |      |       |          |      |       |
|------|-------------|------|-------|----------|------|-------|
|      | Millimeters |      |       | Inches   |      |       |
|      | Min.        | Typ. | Max.  | Min.     | Typ. | Max.  |
| A    | 2.10        |      | 2.50  | 0.083    |      | 0.098 |
| A2   | 0           |      | 0.10  | 0        |      | 0.004 |
| B    | 0.66        |      | 0.86  | 0.026    |      | 0.034 |
| B2   | 5.18        |      | 5.48  | 0.202    |      | 0.216 |
| C    | 0.40        |      | 0.60  | 0.016    |      | 0.024 |
| C2   | 0.44        |      | 0.58  | 0.017    |      | 0.023 |
| D    | 5.90        |      | 6.30  | 0.232    |      | 0.248 |
| D1   | 5.30REF     |      |       | 0.209REF |      |       |
| E    | 6.40        |      | 6.80  | 0.252    |      | 0.268 |
| E1   | 4.63        |      |       | 0.182    |      |       |
| G    | 4.47        |      | 4.67  | 0.176    |      | 0.184 |
| H    | 9.50        |      | 10.70 | 0.374    |      | 0.421 |
| L    | 1.09        |      | 1.21  | 0.043    |      | 0.048 |
| L2   | 1.35        |      | 1.65  | 0.053    |      | 0.065 |
| V1   |             | 7°   |       |          | 7°   |       |
| V2   | 0°          |      | 6°    | 0°       |      | 6°    |

**Ordering information**

| Order code | Package | Baseqty | Delivery mode |
|------------|---------|---------|---------------|
| FDD8896    | TO-252  | 2500    | Tape and reel |