

**• General Description**

The AGM420MBA combines advanced trench MOSFET technology with a low resistance package to provide extremely low  $R_{DS(ON)}$ . This device is ideal for load switch and battery protection applications.

**• Features**

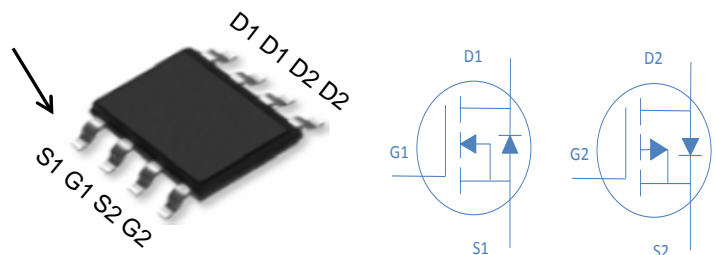
- Advance high cell density Trench technology
- Low  $R_{DS(ON)}$  to minimize conductive loss
- Low Gate Charge for fast switching
- Low Thermal resistance

**• Application**

- MB/VGA Vcore
- SMPS 2<sup>nd</sup> Synchronous Rectifier
- POL application
- BLDC Motor driver

**Product Summary**

| BVDSS | RDSON | ID    |
|-------|-------|-------|
| 40V   | 18mΩ  | 7.6A  |
| -40V  | 40mΩ  | -6.8A |

**SOP-8 Pin Configuration**

**Package Marking and Ordering Information**

| Device Marking | Device    | Device Package | Reel Size | Tape width | Quantity |
|----------------|-----------|----------------|-----------|------------|----------|
| AGM420MB       | AGM420MBA | SOP8           | 325mm     | 16mm       | 3000     |

**Table 1. Absolute Maximum Ratings (TA=25°C)**

| Symbol      | Parameter   | Rating     |            | Units |
|-------------|---|------------|------------|-------|
|             |   | N-Ch       | P-Ch       |       |
| $V_{DS}$    | Drain-Source Voltage ( $V_{GS}=0V$ )                  | 40         | -40        | V     |
| $V_{GS}$    | Gate-Source Voltage ( $V_{DS}=0V$ )                   | ±20        | ±20        | V     |
| $I_D$       | Drain Current-Continuous( $T_c=25^\circ C$ ) (Note 1) | 7.6        | -6.8       | A     |
|             | Drain Current-Continuous( $T_c=100^\circ C$ )         | 5.5        | -4.2       | A     |
| IDM (pluse) | Drain Current-Continuous@ Current-Pulsed (Note 2)     | 24         | -18        | A     |
| $P_D$       | Total Power Dissipation( $T_c=25^\circ C$ )           | 2.6        | 2.6        | W     |
|             | Total Power Dissipation( $T_A=100^\circ C$ )          | 0.7        | 0.7        | W     |
| EAS         | Avalanche energy (Note 3)                             | 22         | 18         | mJ    |
| TJ,TSTG     | Operating Junction and Storage Temperature Range      | -55 To 150 | -55 To 150 | °C    |

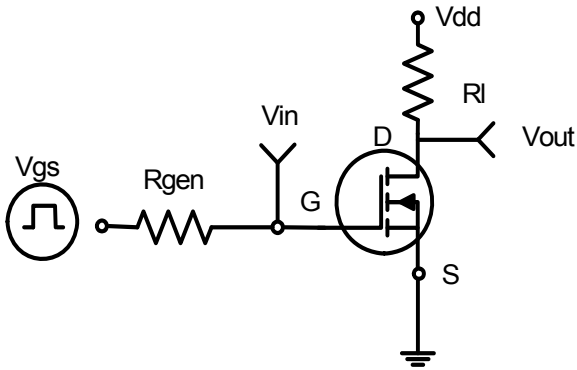
**Table 2. Thermal Characteristic**

| Symbol          | Parameter   | Typ | Max | Unit |
|-----------------|---|-----|-----|------|
| $R_{\theta JA}$ | Thermal Resistance Junction-ambient (Steady State) <sup>1</sup> | --- | 85  | °C/W |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case <sup>1</sup>                   | --- | 50  | °C/W |

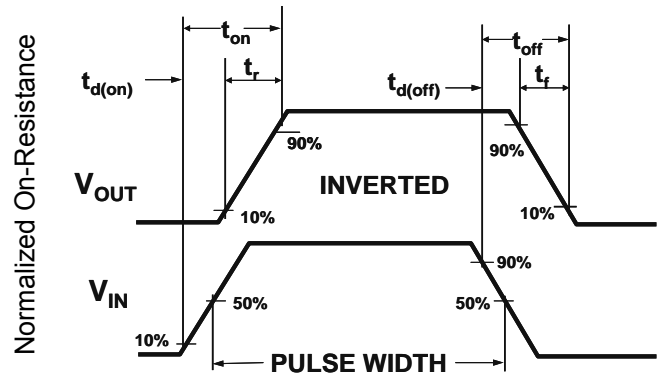
**N-CH Electrical Characteristics ( $T_A=25^{\circ}\text{C}$  unless otherwise noted)**

| Parameter  | Symbol       | Condition  | Min | Typ  | Max      | Unit       |
|--|--------------|--|-----|------|----------|------------|
| <b>Off Characteristics</b>                           |              |  |     |      |          |            |
| Drain-Source Breakdown Voltage                       | $BV_{DSS}$   | $V_{GS}=0V, I_D=250\mu A$                                    | 40  | -    | -        | V          |
| Zero Gate Voltage Drain Current                      | $I_{DSS}$    | $V_{DS}=40V, V_{GS}=0V$                                      | -   | -    | 1        | $\mu A$    |
| Gate-Body Leakage Current                            | $I_{GSS}$    | $V_{GS}=\pm 10V, V_{DS}=0V$                                  | -   | -    | $\pm 10$ | $\mu A$    |
| <b>On Characteristics <sup>(Note 3)</sup></b>        |              |  |     |      |          |            |
| Gate Threshold Voltage                               | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$                                | 1   | 1.8  | 2.5      | V          |
| Drain-Source On-State Resistance                     | $R_{DS(on)}$ | $V_{GS}=10V, I_D=6A$   | -   | 18   | 24       | m $\Omega$ |
|  |              | $V_{GS}=4.5V, I_D=5A$  | -   | 24   | 38       | m $\Omega$ |
| Forward Transconductance                             | $g_{FS}$     | $V_{DS}=5V, I_D=6A$  | 15  | -    | -        | S          |
| <b>Dynamic Characteristics <sup>(Note 4)</sup></b>   |              |  |     |      |          |            |
| Input Capacitance                                    | $C_{iss}$    | $V_{DS}=20V, V_{GS}=0V,$<br>$F=1.0\text{MHz}$                | -   | 516  | -        | PF         |
| Output Capacitance                                   | $C_{oss}$    |  | -   | 82   | -        | PF         |
| Reverse Transfer Capacitance                         | $C_{rss}$    |  | -   | 43   | -        | PF         |
| <b>Switching Characteristics <sup>(Note 4)</sup></b> |              |  |     |      |          |            |
| Turn-on Delay Time                                   | $t_{d(on)}$  | $V_{DD}=15V, R_L=2.5\Omega$<br>$V_{GS}=10V, R_{GEN}=3\Omega$ | -   | 4.5  | -        | nS         |
| Turn-on Rise Time                                    | $t_r$        |  | -   | 2.5  | -        | nS         |
| Turn-Off Delay Time                                  | $t_{d(off)}$ |  | -   | 14.5 | -        | nS         |
| Turn-Off Fall Time                                   | $t_f$        |  | -   | 3.5  | -        | nS         |
| Total Gate Charge                                    | $Q_g$        | $V_{DS}=20V, I_D=6A,$<br>$V_{GS}=10V$                        | -   | 8.9  | -        | nC         |
| Gate-Source Charge                                   | $Q_{gs}$     |  | -   | 2.4  | -        | nC         |
| Gate-Drain Charge                                    | $Q_{gd}$     |  | -   | 1.4  | -        | nC         |
| <b>Drain-Source Diode Characteristics</b>            |              |  |     |      |          |            |
| Diode Forward Voltage <sup>(Note 3)</sup>            | $V_{SD}$     | $V_{GS}=0V, I_S=6A$  | -   | 0.8  | 1.2      | V          |

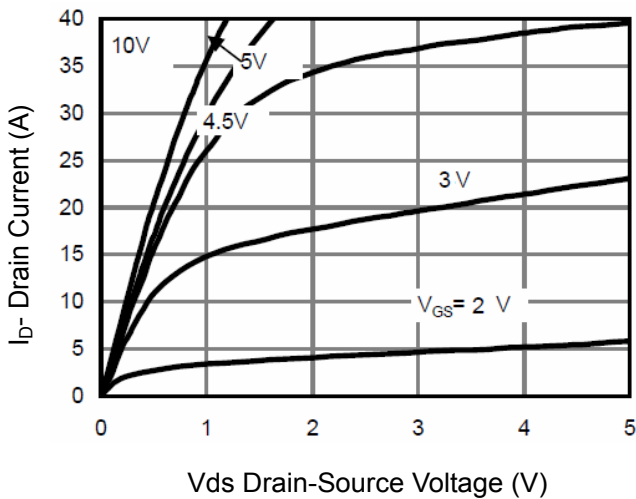
**N- Channel Typical Electrical and Thermal Characteristics (Curves)**



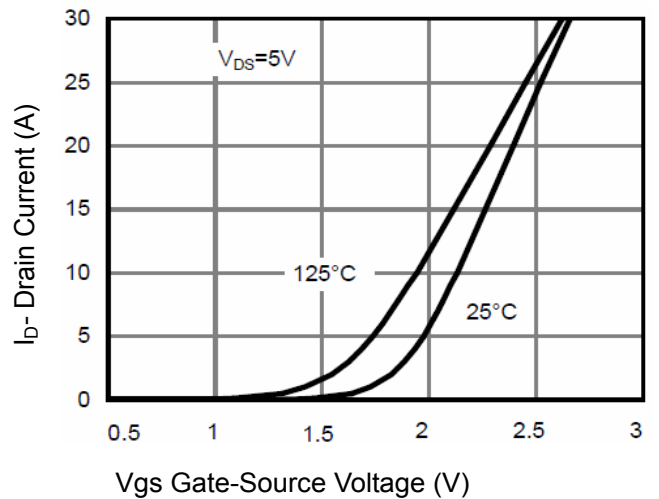
**Figure 1: Switching Test Circuit**



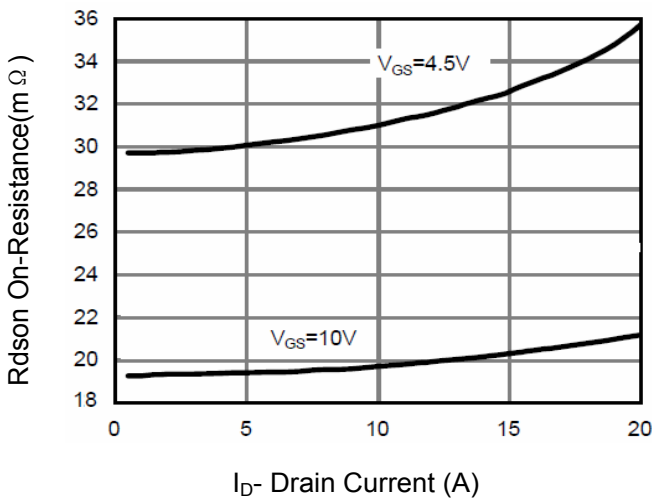
**Figure 2: Switching Waveforms**



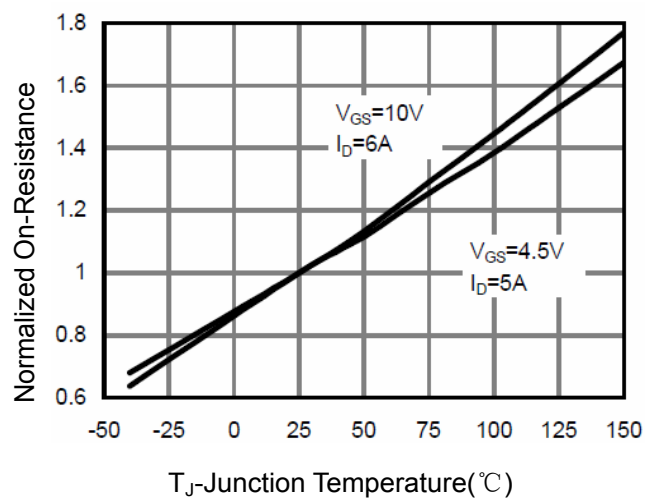
**Figure 3 Output Characteristics**



**Figure 4 Transfer Characteristics**



**Figure 5 Drain-Source On-Resistance**



**Figure 6 Drain-Source On-Resistance**

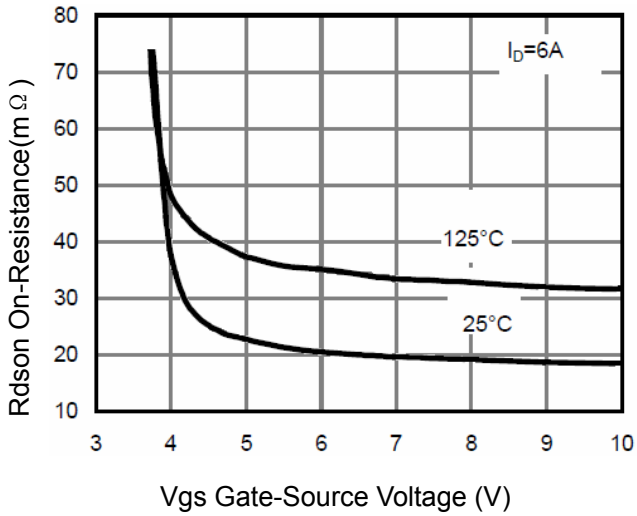


Figure 7 Rdson vs Vgs

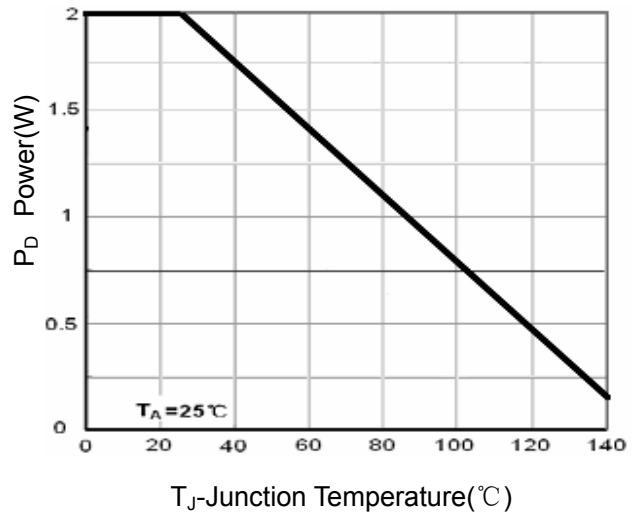


Figure 8 Power Dissipation

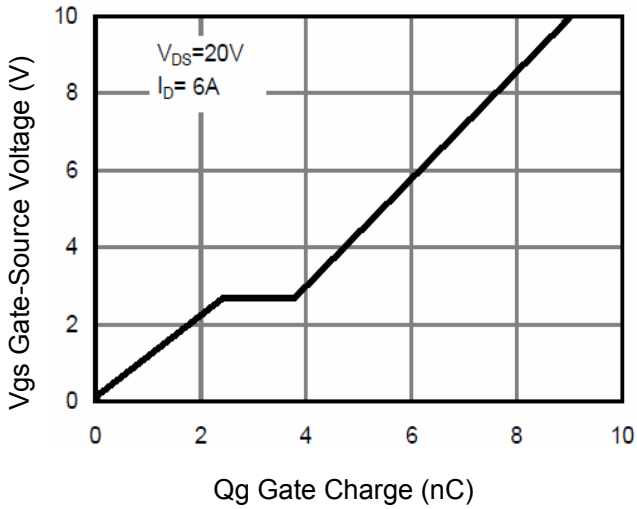


Figure 9 Gate Charge

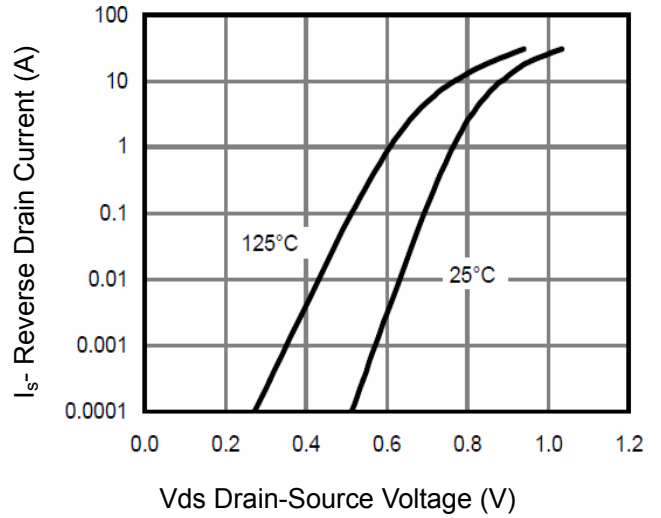


Figure 10 Source- Drain Diode Forward

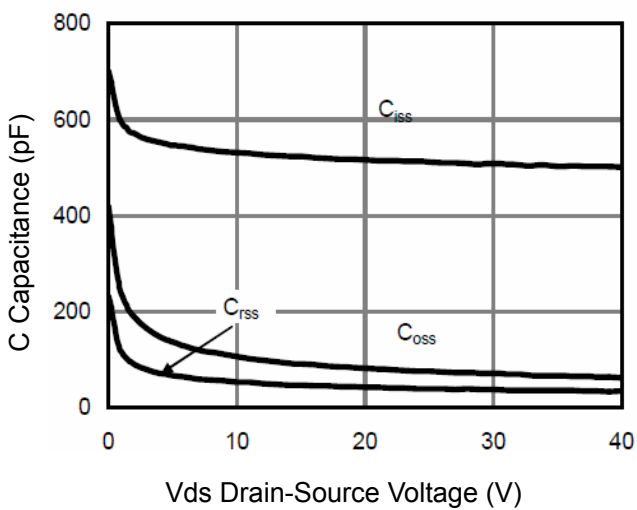


Figure 11 Capacitance vs Vds

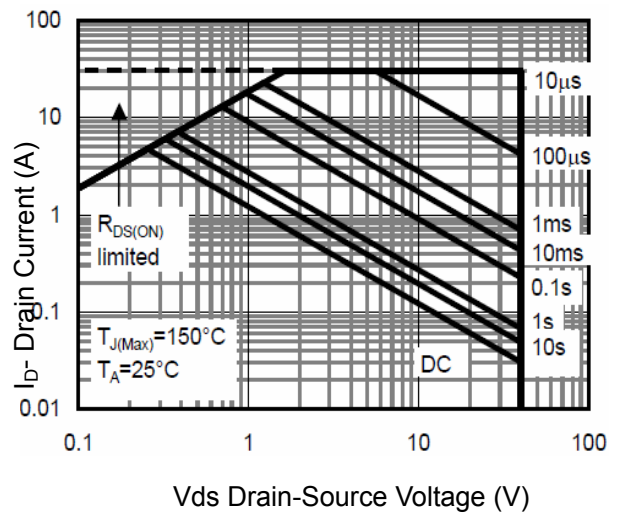
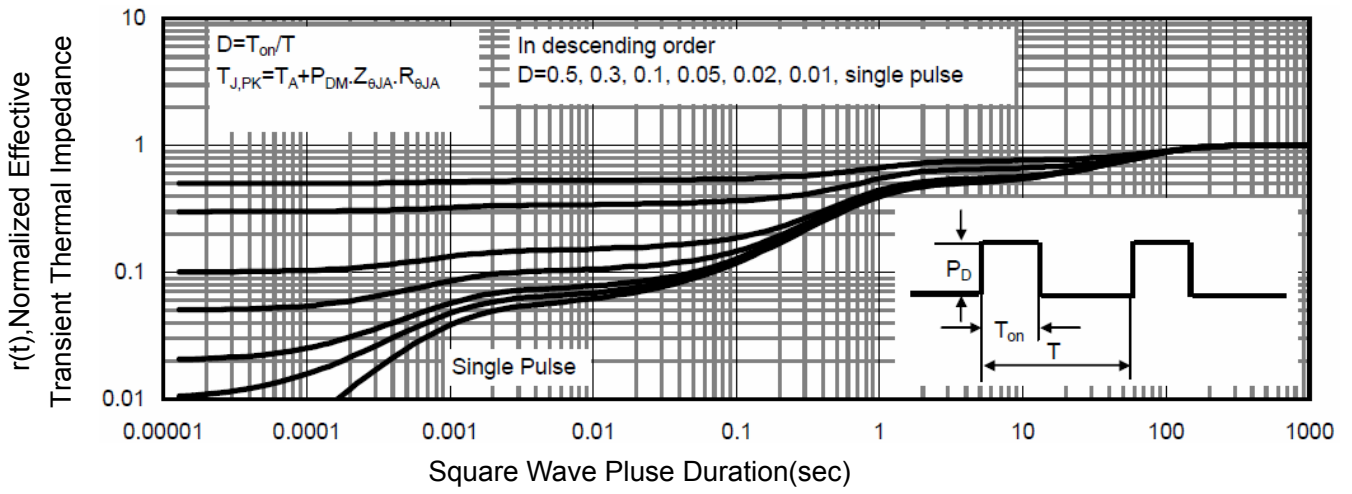


Figure 12 Safe Operation Area



**Figure 13 Normalized Maximum Transient Thermal Impedance**

**●Electronic Characteristics**

| Parameter                         | Symbol       | Condition                          | Min. | Typ | Max.      | Unit      |
|-----------------------------------|--------------|------------------------------------|------|-----|-----------|-----------|
| Drain-Source Breakdown Voltage    | $BV_{DSS}$   | $V_{GS} = 0V, I_D = 250\mu A$      | -40  |     |           | V         |
| Gate Threshold Voltage            | $V_{GS(TH)}$ | $V_{GS} = V_{DS}, I_D = -250\mu A$ | -1.1 | 1.7 | -2.5      | V         |
| Drain-Source Leakage Current      | $I_{DSS}$    | $V_{DS} = -40V, V_{GS} = 0V$       |      |     | 1.0       | $\mu A$   |
| Gate- Source Leakage Current      | $I_{GSS}$    | $V_{GS} = \pm 20V, V_{DS} = 0V$    |      |     | $\pm 100$ | nA        |
| Static Drain-source On Resistance | $R_{DS(ON)}$ | $V_{GS} = -10V, I_D = -6A$         |      | 39  | 58        | $m\Omega$ |
|                                   |              | $V_{GS} = -4.5V, I_D = -5A$        |      | 61  | 78        | $m\Omega$ |
| Forward Transconductance          | $g_{FS}$     | $V_{DS} = -10V, I_D = -5A$         |      | 5   |           | S         |
| Source-drain voltage              | $V_{SD}$     | $I_S = -6A$                        |      | 0.8 | 1.2       | V         |

**●Electronic Characteristics**

| Parameter                    | Symbol    | Condition  | Min. | Typ | Max. | Unit |
|------------------------------|-----------|------------|------|-----|------|------|
| Gate Resistance              | $R_G$     | $f = 1MHz$ |      |     |      | $pF$ |
| Input capacitance            | $C_{iss}$ |            | -    | 750 | -    |      |
| Output capacitance           | $C_{oss}$ |            | -    | 105 | -    |      |
| Reverse transfer capacitance | $C_{rss}$ |            | -    | 64  | -    |      |

**●Gate Charge characteristics( $T_a = 25^\circ C$ )**

| Parameter            | Symbol   | Condition       | Min. | Typ | Max. | Unit |
|----------------------|----------|-----------------|------|-----|------|------|
| Total gate charge    | $Q_g$    | $V_{DD} = -25V$ | -    | 12  | -    | nC   |
| Gate - Source charge | $Q_{gs}$ | $I_D = -8A$     | -    | 2.4 | -    |      |
| Gate - Drain charge  | $Q_{gd}$ | $V_{GS} = -10V$ | -    | 2.8 | -    |      |

Note: ① Pulse Test : Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$  ;

② Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate;

Fig.1 Power Dissipation Derating Curve

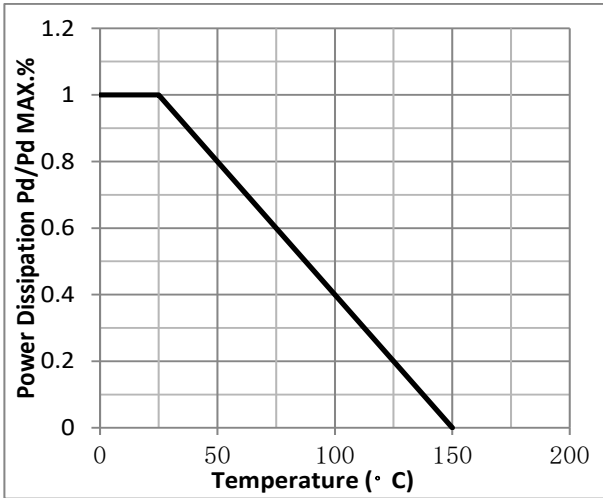


Fig.2 Typical output Characteristics

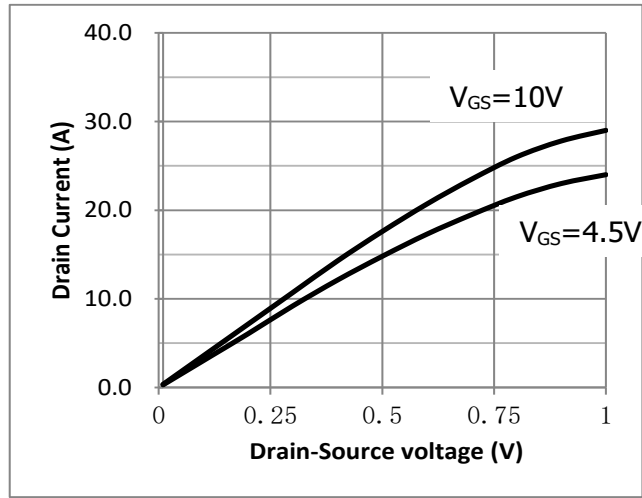


Fig.3 Threshold Voltage V.S Junction Temperature

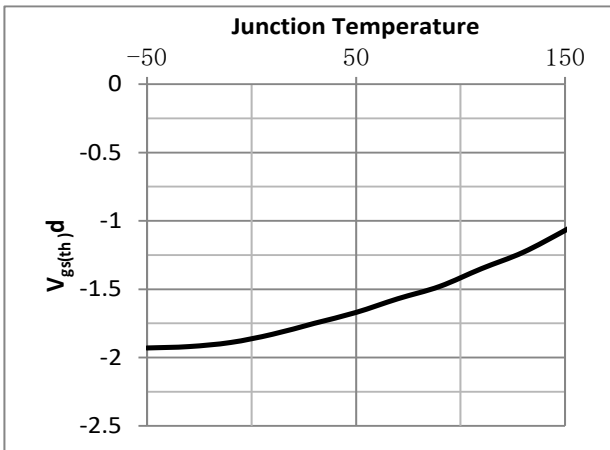


Fig.4 Resistance V.S Drain Current

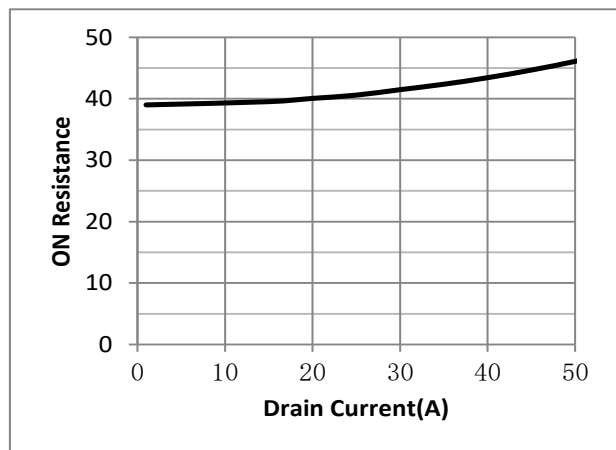


Fig.5 On-Resistance VS Gate Source Voltage

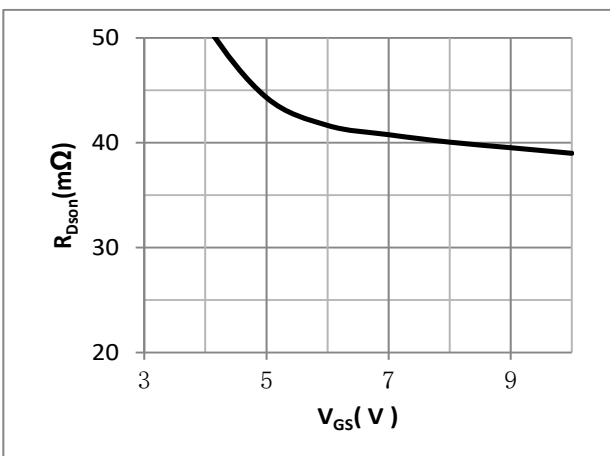


Fig.6 On-Resistance V.S Junction Temperature

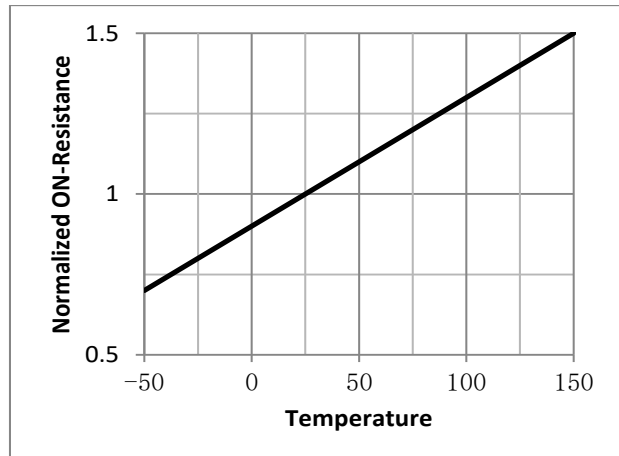


Fig.7 Switching Time Measurement Circuit

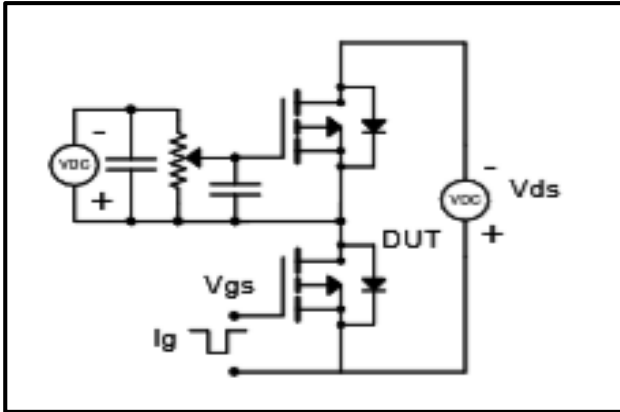


Fig.8 Gate Charge Waveform

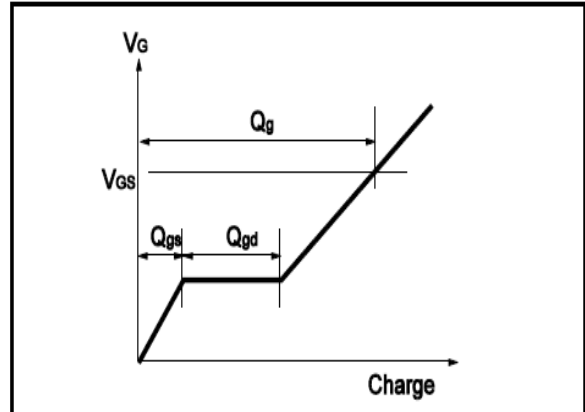


Fig.9 Switching Time Measurement Circuit

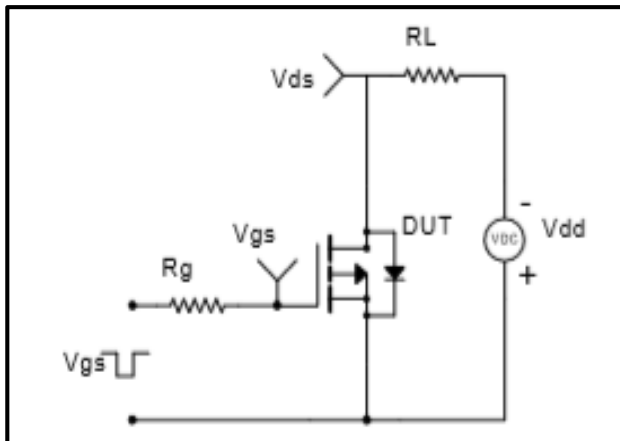


Fig.10 Gate Charge Waveform

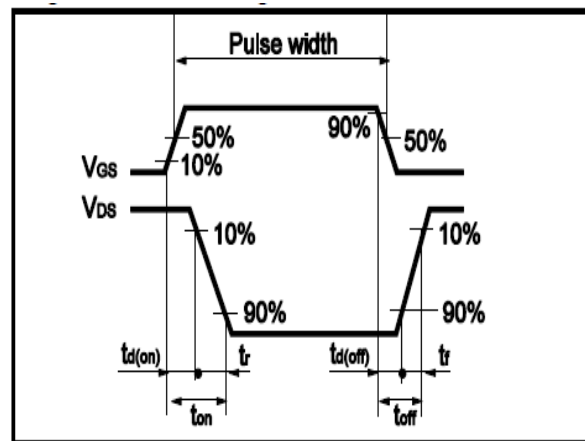


Fig.11 Avalanche Measurement Circuit

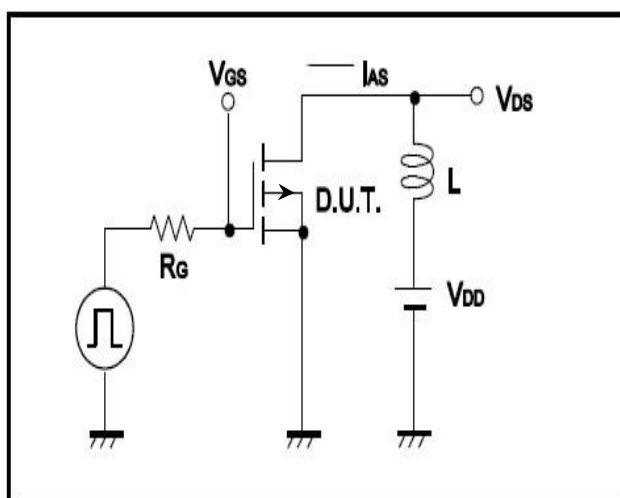
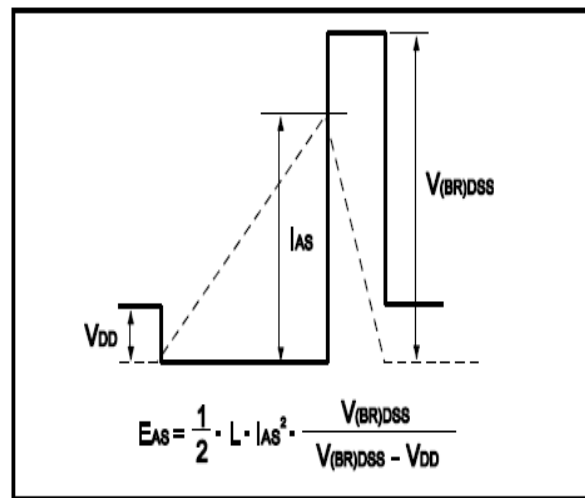
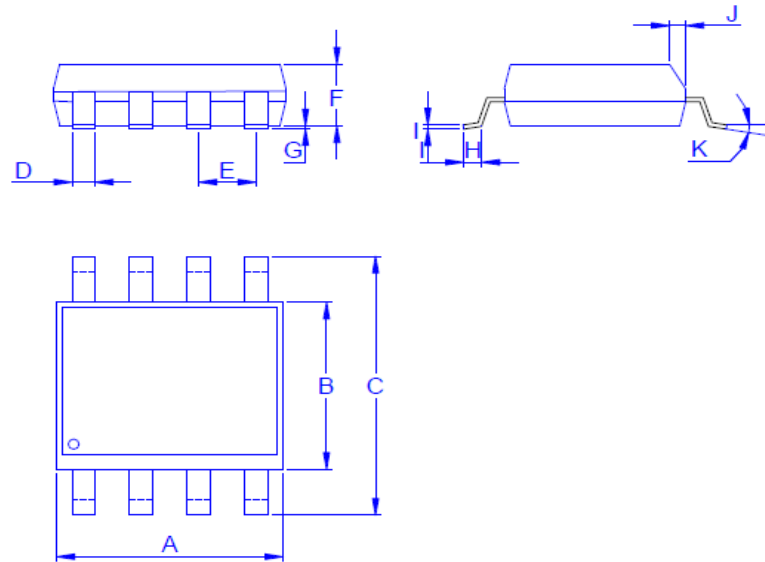


Fig.12 Avalanche Waveform





**SOIC-8, 8 leads**

**Dimension in mm**

| Dimension | A    | B    | C    | D    | E    | F    | G    | H    | I    | J    | K  |
|-----------|------|------|------|------|------|------|------|------|------|------|----|
| Min.      | 4.70 | 3.70 | 5.80 | 0.33 |      | 1.20 | 0.08 | 0.40 | 0.19 | 0.25 | 0° |
| Typ.      |      |      |      |      | 1.27 |      |      |      |      |      |    |
| Max.      | 5.10 | 4.10 | 6.20 | 0.51 |      | 1.62 | 0.28 | 0.83 | 0.26 | 0.50 | 8° |


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