

### • General Description

The ZMC88303S combines advanced trench MOSFET technology with a low resistance package to provide extremely low  $R_{DS(ON)}$ . It combine one N Channel MOSFET and one P channel MOSFET.

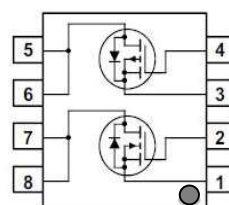
### • Features

- Advance high cell density Trench technology
- Low  $R_{DS(ON)}$  to minimize conductive loss
- Low Gate Charge for fast switching
- Dual DIE in one package

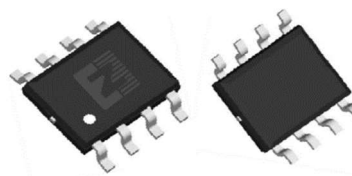
### • Application

- Power Management in Notebook Computer
- BLDC Motor driver

### • Product Summary



$V_{DS1} = 30V$   
 $V_{DS2} = -30V$   
 $R_{DS(ON)1} = 14m\Omega$   
 $R_{DS(ON)2} = 26m\Omega$   
 $I_{D1} = 9A$   
 $I_{D2} = -6A$



SOP-8



### • Ordering Information:

|                           |           |
|---------------------------|-----------|
| Part NO.                  | ZMC88303S |
| Marking                   | ZMC88303  |
| Packing Information       | REEL TAPE |
| Basic ordering unit (pcs) | 4000      |

### • N Channel Absolute Maximum Ratings ( $T_c = 25^\circ C$ )

| Parameter                                  | Symbol                 | Rating     | Unit       |
|--------------------------------------------|------------------------|------------|------------|
| Drain-Source Voltage                       | $V_{DS}$               | 30         | V          |
| Gate-Source Voltage                        | $V_{GS}$               | $\pm 20$   | V          |
| Continuous Drain Current                   | $I_{D@TC=25^\circ C}$  | 9          | A          |
|                                            | $I_{D@TC=75^\circ C}$  | 6.84       | A          |
|                                            | $I_{D@TC=100^\circ C}$ | 5.67       | A          |
| Pulsed Drain Current <sup>①</sup>          | $I_{DM}$               | 20         | A          |
| Total Power Dissipation( $TC=25^\circ C$ ) | $P_D@TC=25^\circ C$    | 3.6        | W          |
| Total Power Dissipation( $TA=25^\circ C$ ) | $P_D@TA=25^\circ C$    | 0.69       | W          |
| Operating Junction Temperature             | $T_J$                  | -55 to 150 | $^\circ C$ |
| Storage Temperature                        | $T_{STG}$              | -55 to 150 | $^\circ C$ |
| Single Pulse Avalanche Energy              | $E_{AS}$               | 45         | mJ         |

**•P Channel Absolute Maximum Ratings ( $T_c = 25^\circ\text{C}$ )**

| Parameter                                        | Symbol                       | Rating     | Unit             |
|--------------------------------------------------|------------------------------|------------|------------------|
| Drain-Source Voltage                             | $V_{DS}$                     | -30        | V                |
| Gate-Source Voltage                              | $V_{GS}$                     | $\pm 20$   | V                |
| Continuous Drain Current                         | $I_{D@TC=25^\circ\text{C}}$  | -6         | A                |
|                                                  | $I_{D@TC=75^\circ\text{C}}$  | -4.6       | A                |
|                                                  | $I_{D@TC=100^\circ\text{C}}$ | -3.8       | A                |
| Pulsed Drain Current <sup>①</sup>                | $I_{DM}$                     | -14        | A                |
| Total Power Dissipation( $TC=25^\circ\text{C}$ ) | $P_{D@TC=25^\circ\text{C}}$  | 3.6        | W                |
| Total Power Dissipation( $TA=25^\circ\text{C}$ ) | $P_{D@TA=25^\circ\text{C}}$  | 0.69       | W                |
| Operating Junction Temperature                   | $T_J$                        | -55 to 150 | $^\circ\text{C}$ |
| Storage Temperature                              | $T_{STG}$                    | -55 to 150 | $^\circ\text{C}$ |
| Single Pulse Avalanche Energy                    | $E_{AS}$                     | 35         | mJ               |

**•Thermal resistance**

| Parameter                                    | Symbol     | Min. | Typ. | Max. | Unit               |
|----------------------------------------------|------------|------|------|------|--------------------|
| Thermal resistance, junction - case          | $R_{thJC}$ | -    | -    | 34   | $^\circ\text{C/W}$ |
| Thermal resistance, junction - ambient       | $R_{thJA}$ | -    | -    | 180  | $^\circ\text{C/W}$ |
| Soldering temperature, wavesoldering for 10s | $T_{sold}$ | -    | -    | 265  | $^\circ\text{C}$   |

**•N Channel Electronic Characteristics**

| Parameter                         | Symbol       | Condition                               | Min. | Typ | Max.      | Unit          |
|-----------------------------------|--------------|-----------------------------------------|------|-----|-----------|---------------|
| Drain-Source Breakdown Voltage    | $BV_{DSS}$   | $V_{GS} = 0V, I_D = 250\mu\text{A}$     | 30   |     |           | V             |
| Gate Threshold Voltage            | $V_{GS(TH)}$ | $V_{GS} = V_{DS}, I_D = 250\mu\text{A}$ | 1.2  | 1.6 | 2.5       | V             |
| Drain-Source Leakage Current      | $I_{DSS}$    | $V_{DS} = 30V, V_{GS} = 0V$             |      |     | 1.0       | $\mu\text{A}$ |
| Gate- Source Leakage Current      | $I_{GSS}$    | $V_{GS} = \pm 20V, V_{DS} = 0V$         |      |     | $\pm 100$ | nA            |
| Static Drain-source On Resistance | $R_{DS(ON)}$ | $V_{GS} = 10V, I_D = 6A$                |      | 14  | 17        | m $\Omega$    |
|                                   |              | $V_{GS} = 4.5V, I_D = 4A$               |      | 18  | 22        | m $\Omega$    |
| Forward Transconductance          | $g_{FS}$     | $V_{DS} = 25V, I_D = 5A$                |      | 8   |           | s             |
| Source-drain voltage              | $V_{SD}$     | $I_s = 6A$                              |      |     | 1.28      | V             |

**•Electronic Characteristics**

| Parameter                    | Symbol    | Condition           | Min. | Typ | Max. | Unit |
|------------------------------|-----------|---------------------|------|-----|------|------|
| Input capacitance            | $C_{iss}$ | VDS=25V<br>f = 1MHz | -    | 800 | -    | pF   |
| Output capacitance           | $C_{oss}$ |                     | -    | 75  | -    |      |
| Reverse transfer capacitance | $C_{rss}$ |                     | -    | 90  | -    |      |

**•Gate Charge characteristics(T<sub>a</sub> = 25°C)**

| Parameter            | Symbol   | Condition             | Min. | Typ  | Max. | Unit |
|----------------------|----------|-----------------------|------|------|------|------|
| Total gate charge    | $Q_g$    | V <sub>DD</sub> = 15V | -    | 10.5 | -    | nC   |
| Gate - Source charge | $Q_{gs}$ | I <sub>D</sub> = 6A   | -    | 2.8  | -    |      |
| Gate - Drain charge  | $Q_{gd}$ | V <sub>GS</sub> = 10V | -    | 1.6  | -    |      |

**•P Channel Electronic Characteristics**

| Parameter                         | Symbol              | Condition                                                   | Min. | Typ | Max. | Unit |
|-----------------------------------|---------------------|-------------------------------------------------------------|------|-----|------|------|
| Drain-Source Breakdown Voltage    | BV <sub>DSS</sub>   | V <sub>GS</sub> = 0V, I <sub>D</sub> = -250uA               | -30  |     |      | V    |
| Gate Threshold Voltage            | V <sub>GS(TH)</sub> | V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = -250uA | -1.2 |     | -2.5 | V    |
| Drain-Source Leakage Current      | I <sub>DSS</sub>    | V <sub>DS</sub> = -30V, V <sub>GS</sub> = 0V                |      |     | -1.0 | uA   |
| Gate- Source Leakage Current      | I <sub>GSS</sub>    | V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V                |      |     | ±100 | nA   |
| Static Drain-source On Resistance | R <sub>DS(ON)</sub> | V <sub>GS</sub> = -10V, I <sub>D</sub> = -6A                |      | 26  | 30   | mΩ   |
|                                   |                     | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -4A               |      | 35  | 40   | mΩ   |
| Forward Transconductance          | g <sub>FS</sub>     | V <sub>DS</sub> = -10V, I <sub>D</sub> = -5A                |      | 8   |      | s    |
| Source-drain voltage              | V <sub>SD</sub>     | I <sub>S</sub> = -6A                                        |      |     | 1.28 | V    |

**•Electronic Characteristics**

| Parameter                    | Symbol    | Condition            | Min. | Typ | Max. | Unit |
|------------------------------|-----------|----------------------|------|-----|------|------|
| Input capacitance            | $C_{iss}$ | VDS=-25V<br>f = 1MHz | -    | 800 | -    | pF   |
| Output capacitance           | $C_{oss}$ |                      | -    | 225 | -    |      |
| Reverse transfer capacitance | $C_{rss}$ |                      | -    | 100 | -    |      |

**•Gate Charge characteristics(T<sub>a</sub> = 25°C)**

| Parameter            | Symbol   | Condition              | Min. | Typ  | Max. | Unit |
|----------------------|----------|------------------------|------|------|------|------|
| Total gate charge    | $Q_g$    | V <sub>DD</sub> = -15V | -    | 16.5 | -    | nC   |
| Gate - Source charge | $Q_{gs}$ | I <sub>D</sub> = -6A   | -    | 2.5  | -    |      |
| Gate - Drain charge  | $Q_{gd}$ | V <sub>GS</sub> = -10V | -    | 3.1  | -    |      |

•N Channel characteristics curve

Fig.1 Power Dissipation

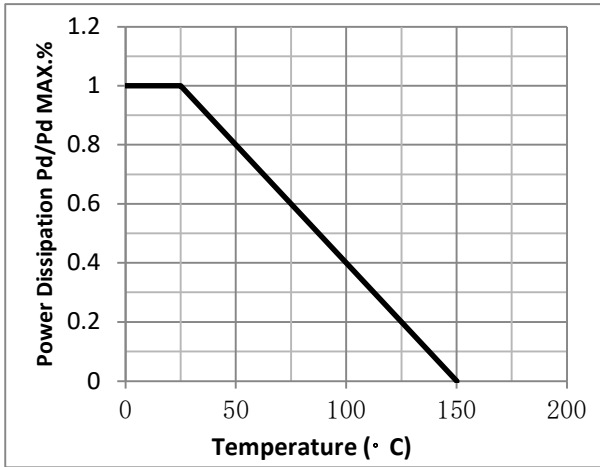


Fig.2 Typical output Characteristics

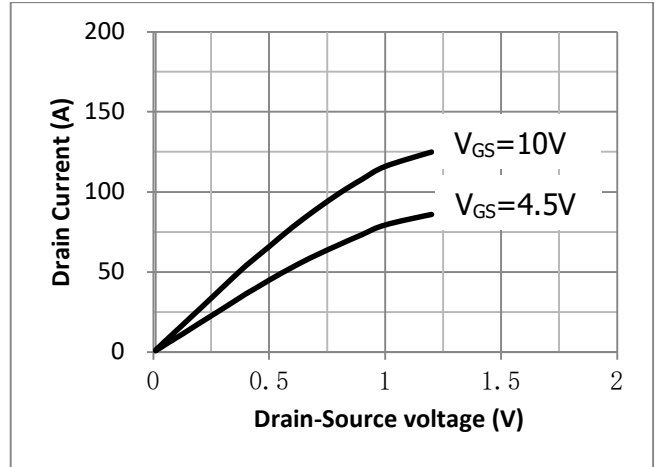


Fig.3 Threshold Voltage V.S Junction Temperature

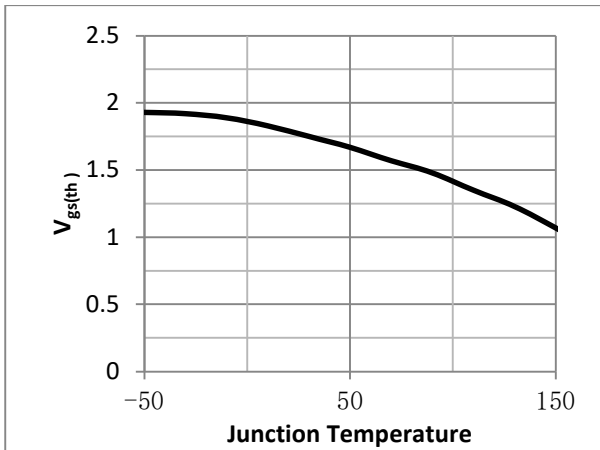


Fig.4 Resistance V.S Drain Current

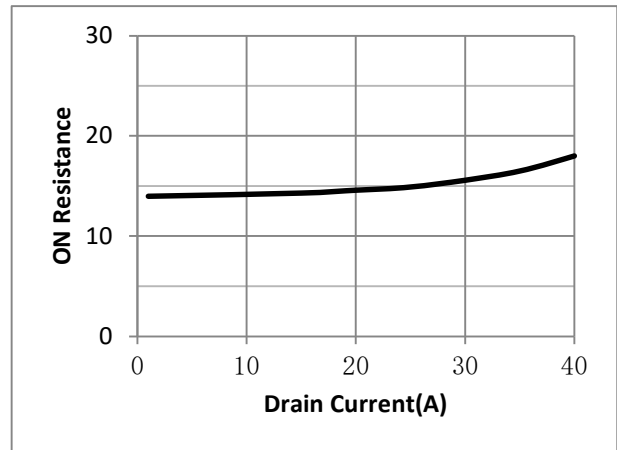


Fig.5 On-Resistance VS Gate Source Voltage

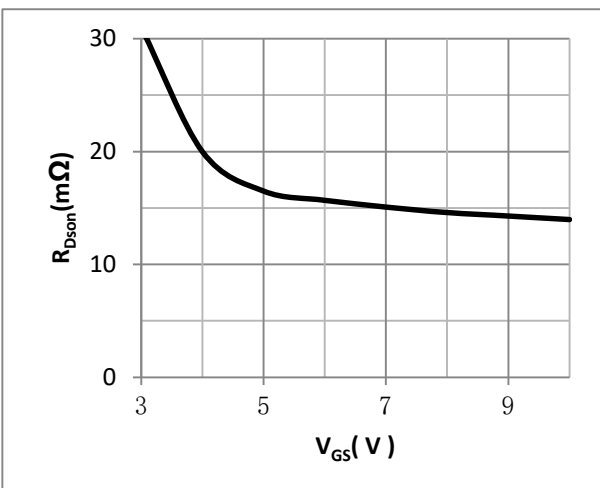
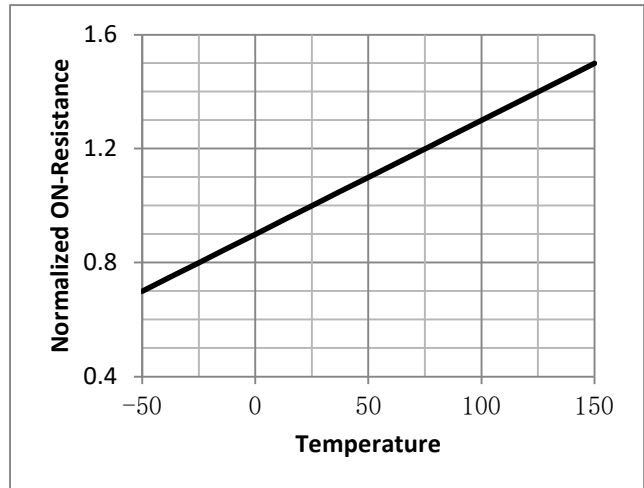


Fig.6 On-Resistance V.S Junction Temperature



•P Channel characteristics curve

Fig.1 Power Dissipation Derating Curve

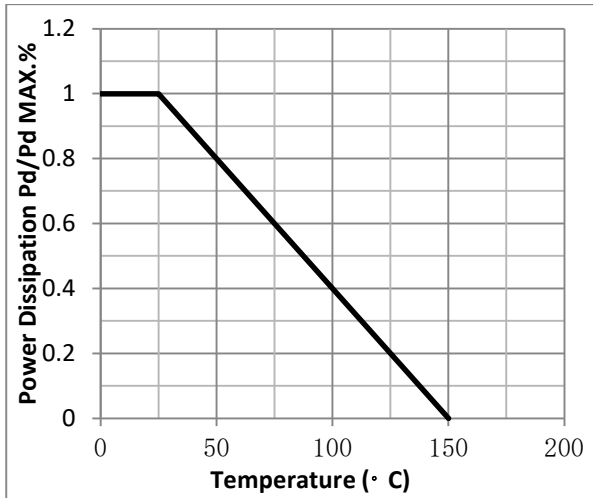


Fig.2 Typical output Characteristics

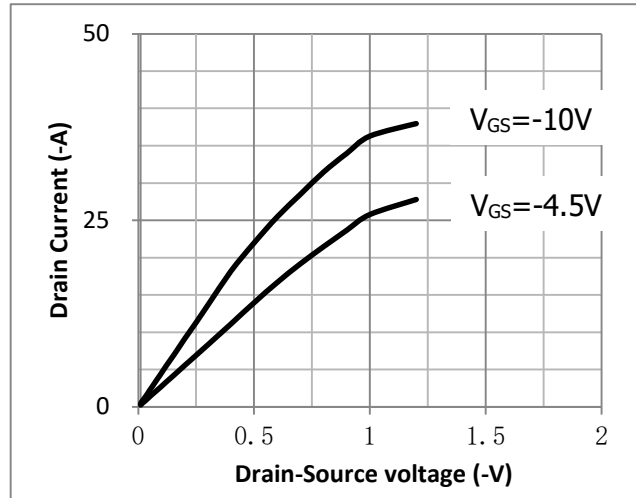


Fig.3 Threshold Voltage V.S Junction Temperature

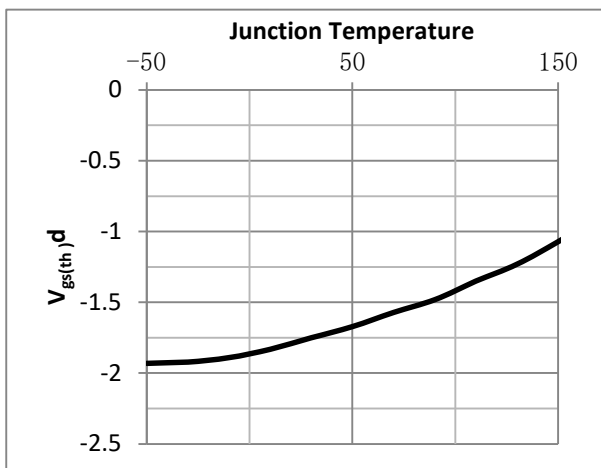


Fig.4 Resistance V.S Drain Current

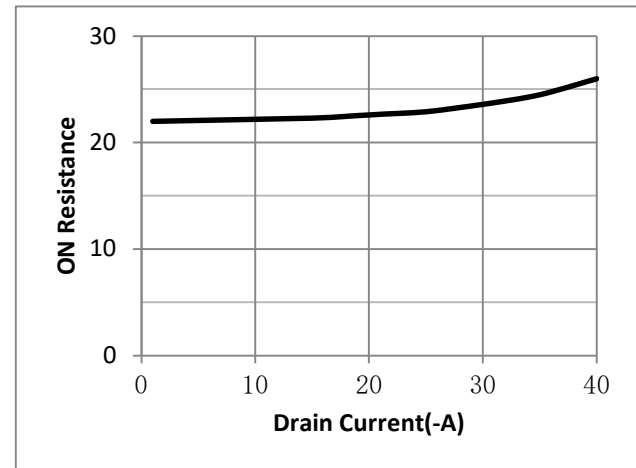


Fig.5 On-Resistance VS Gate Source Voltage

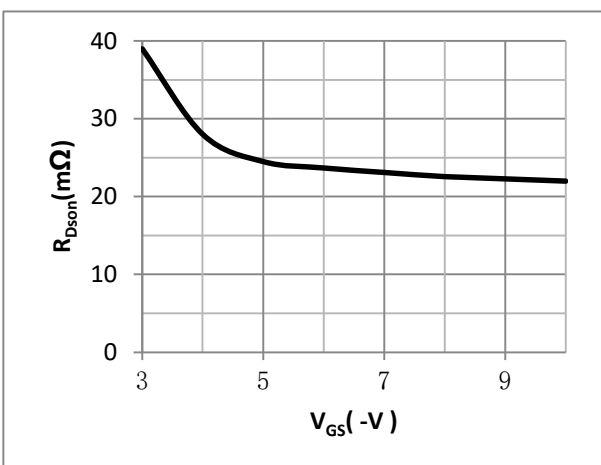
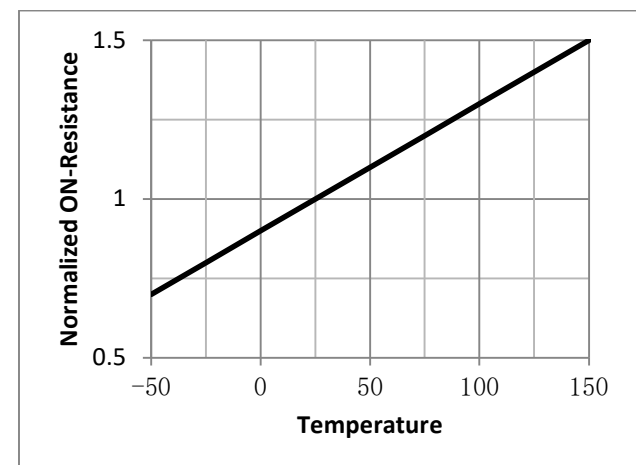


Fig.6 On-Resistance V.S Junction Temperature



•Test Circuit

Fig.1 Gate Charge Measurement Circuit

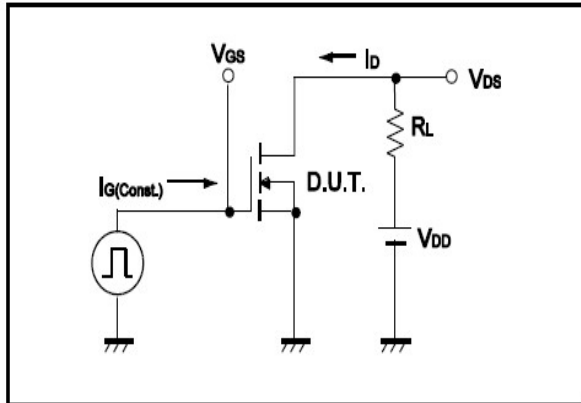


Fig.2 Gate Charge Waveform

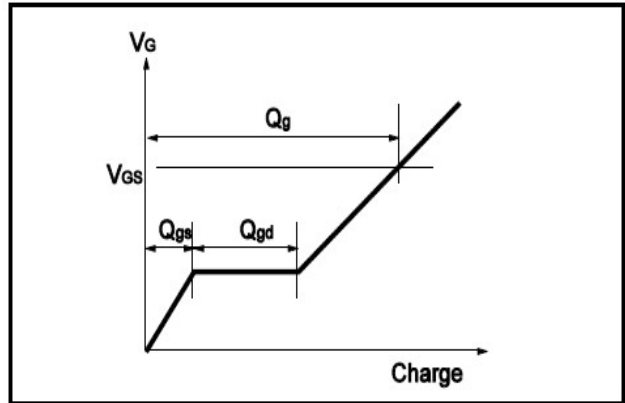


Fig.3 Switching Time Measurement Circuit

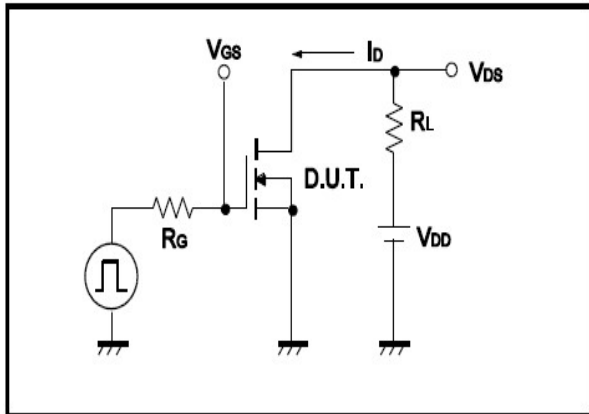


Fig.4 Switching Time Waveform

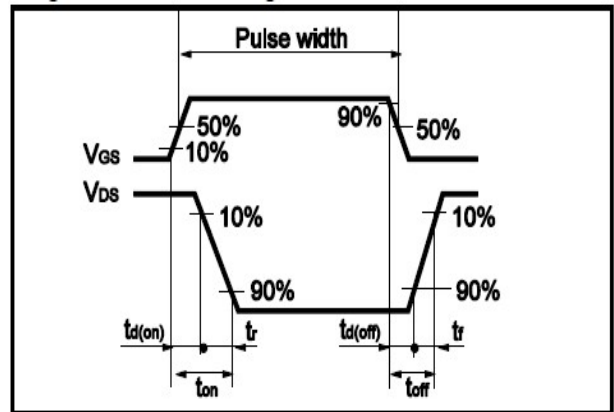


Fig.5 Avalanche Measurement Circuit

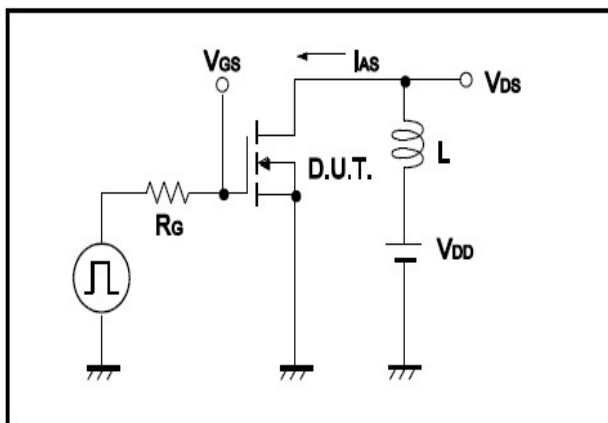
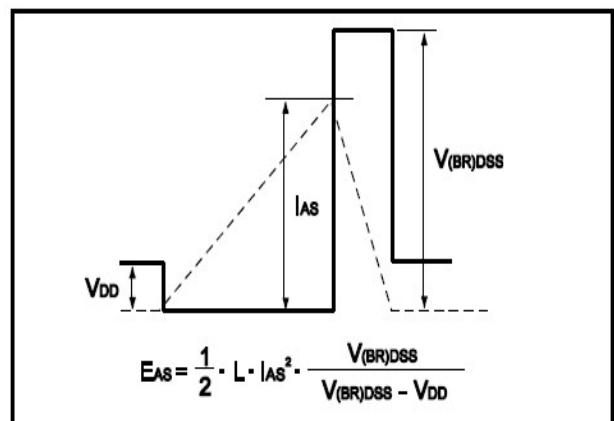


Fig.6 Avalanche Waveform



•Dimensions(SOP-8)

Unit: mm

| SYMBOL | min  | TYP  | max  | SYMBOL | min  |      | max  |
|--------|------|------|------|--------|------|------|------|
| A      | 4.80 |      | 5.00 | C      | 1.30 |      | 1.50 |
| A1     | 0.37 |      | 0.47 | C1     | 0.55 |      | 0.75 |
| A2     |      | 1.27 |      | C2     | 0.55 |      | 0.65 |
| A3     |      | 0.41 |      | C3     | 0.05 |      | 0.20 |
| B      | 5.80 |      | 6.20 | C4     | 0.19 | 0.20 | 0.23 |
| B1     | 3.80 |      | 4.00 | D      |      | 1.05 |      |
| B2     |      | 5.00 |      | D1     | 0.40 |      | 0.62 |

