

## General Description:

The LWS60110A23 uses advanced SGT technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It can be used in a wide variety of applications. The package form is SOT-223, which accords with the ROHS standard and Halogen Free standard.

## Features:

- Fast Switching
- Low Gate Charge and  $R_{DS(ON)}$
- Low Reverse transfer capacitances

## Applications:

- Battery switching application
- Hard switched and high frequency circuits
- Power Management

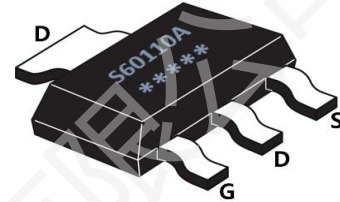
**100% DVDS Tested**

**100% Avalanche Tested**

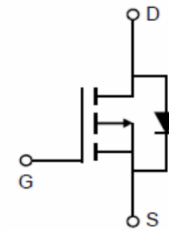


|                   |      |    |
|-------------------|------|----|
| $V_{DSS}$         | -60  | V  |
| $I_D$             | -4.0 | A  |
| $P_D$             | 3.0  | W  |
| $R_{DS(ON)}$ TYPE | 90   | mΩ |

Marking and Pin Assignment



Inner Equivalent Principium Chart



## Package Marking and Ordering Information:

| Marking      | Part Number | Package | Packing | Qty.     |
|--------------|-------------|---------|---------|----------|
| S60110A/D.C. | LWS60110A23 | SOT-223 | Reel    | 1000 Pcs |

## Absolute Maximum Ratings:

| Symbol         | Parameter                                        |                           | Value           | Units              |
|----------------|--------------------------------------------------|---------------------------|-----------------|--------------------|
| $V_{DSS}$      | Drain-to-Source Voltage                          |                           | -60             | V                  |
| $I_D$          | Continuous Drain Current                         | $T_A=25^{\circ}\text{C}$  | -4.0            | A                  |
|                | Continuous Drain Current                         | $T_A=100^{\circ}\text{C}$ | -2.5            | A                  |
| $I_{DM}^{a1}$  | Pulsed Drain Current                             |                           | -16             | A                  |
| $V_{GS}$       | Gate-to-Source Voltage                           |                           | $\pm 20$        | V                  |
| $P_D$          | Power Dissipation                                |                           | 3.0             | W                  |
| $E_{AS}^{a2}$  | Single pulse avalanche energy                    |                           | 11              | mJ                 |
| $T_J, T_{STG}$ | Operating Junction and Storage Temperature Range |                           | 150, -55 to 150 | $^{\circ}\text{C}$ |
| $T_L$          | Maximum Temperature for Soldering                |                           | 260             | $^{\circ}\text{C}$ |

## Thermal Characteristics:

| Symbol               | Parameter                               | Value | Units                |
|----------------------|-----------------------------------------|-------|----------------------|
| $R_{\theta JA}^{a3}$ | Thermal Resistance, Junction-to-Ambient | 41.7  | $^{\circ}\text{C/W}$ |

**Electrical Characteristic** ( $T_J = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified):

| Static Characteristics |                                   |                                |       |      |      |            |
|------------------------|-----------------------------------|--------------------------------|-------|------|------|------------|
| Symbol                 | Parameter                         | Test Conditions                | Value |      |      | Units      |
|                        |                                   |                                | Min.  | Typ. | Max. |            |
| $V_{DSS}$              | Drain to Source Breakdown Voltage | $V_{GS}=0V, I_D=-250\mu A$     | -60   | --   | --   | V          |
| $I_{DSS}$              | Drain to Source Leakage Current   | $V_{DS}=-60V, V_{GS}=0V$       | --    | --   | -1.0 | $\mu A$    |
| $I_{GSS(F)}$           | Gate to Source Forward Leakage    | $V_{GS}=-20V, V_{DS}=0V$       | --    | --   | -100 | nA         |
| $I_{GSS(R)}$           | Gate to Source Reverse Leakage    | $V_{GS}=+20V, V_{DS}=0V$       | --    | --   | 100  | nA         |
| $V_{GS(TH)}$           | Gate Threshold Voltage            | $V_{DS}=V_{GS}, I_D=-250\mu A$ | -1.1  | -1.6 | -2.1 | V          |
| $R_{DS(ON)1}$          | Drain-to-Source On-Resistance     | $V_{GS}=-10V, I_D=-3.0A$       | --    | 90   | 110  | m $\Omega$ |
| $R_{DS(ON)2}$          | Drain-to-Source On-Resistance     | $V_{GS}=-4.5V, I_D=-2.0A$      | --    | 110  | 150  | m $\Omega$ |

| Dynamic Characteristics |                              |                                |       |      |      |          |
|-------------------------|------------------------------|--------------------------------|-------|------|------|----------|
| Symbol                  | Parameter                    | Test Conditions                | Value |      |      | Units    |
|                         |                              |                                | Min.  | Typ. | Max. |          |
| $C_{iss}$               | Input Capacitance            | $V_{GS}=0V$                    | --    | 295  | --   | pF       |
| $C_{oss}$               | Output Capacitance           | $V_{DS}=-30V$                  | --    | 60   | --   |          |
| $C_{rss}$               | Reverse Transfer Capacitance | $f=1.0MHz$                     | --    | 11.4 | --   |          |
| $R_G$                   | Gate resistance              | $V_{GS}=0V, V_{DS}=0V, f=1MHz$ | --    | 38   | --   | $\Omega$ |

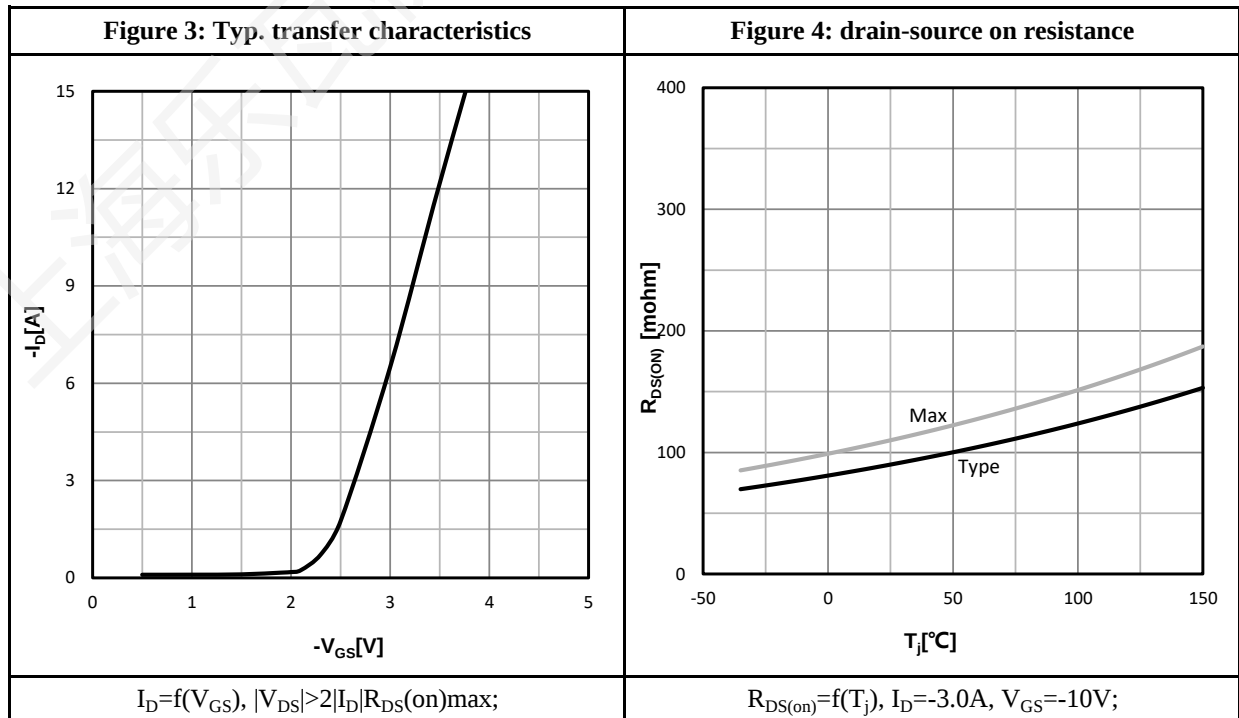
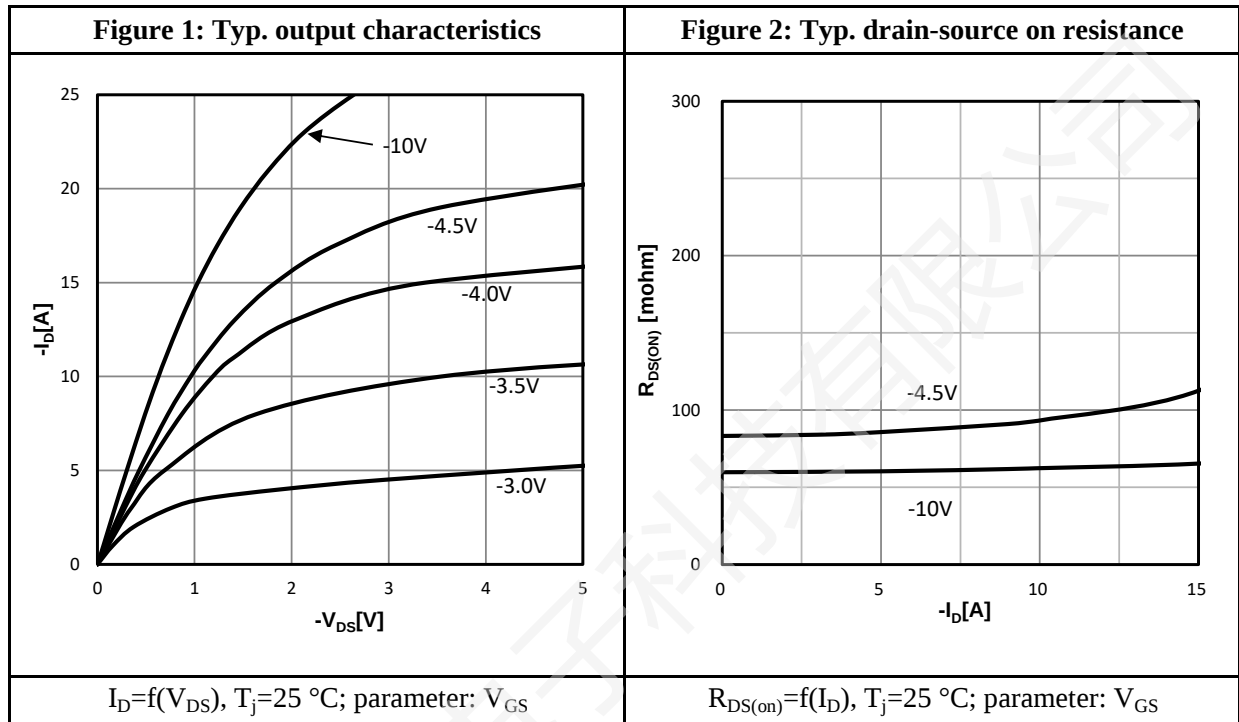
| Resistive Switching Characteristics |                       |                 |       |      |      |       |
|-------------------------------------|-----------------------|-----------------|-------|------|------|-------|
| Symbol                              | Parameter             | Test Conditions | Value |      |      | Units |
|                                     |                       |                 | Min.  | Typ. | Max. |       |
| $t_{d(ON)}$                         | Turn-on Delay Time    | $I_D=-3.0A$     | --    | 6.3  | --   | ns    |
| $t_r$                               | Rise Time             | $V_{DS}=-30V$   | --    | 12.8 | --   |       |
| $t_{d(OFF)}$                        | Turn-Off Delay Time   | $V_{GS}=-10V$   | --    | 5.0  | --   |       |
| $t_f$                               | Fall Time             | $R_G=3.0\Omega$ | --    | 4.1  | --   |       |
| $Q_g$                               | Total Gate Charge     | $V_{GS}=-10V$   | --    | 6.2  | --   | nC    |
| $Q_{gs}$                            | Gate to Source Charge | $V_{DS}=-30V$   | --    | 1.2  | --   |       |
| $Q_{gd}$                            | Gate to Drain Charge  | $I_D=-5.0A$     | --    | 1.4  | --   |       |

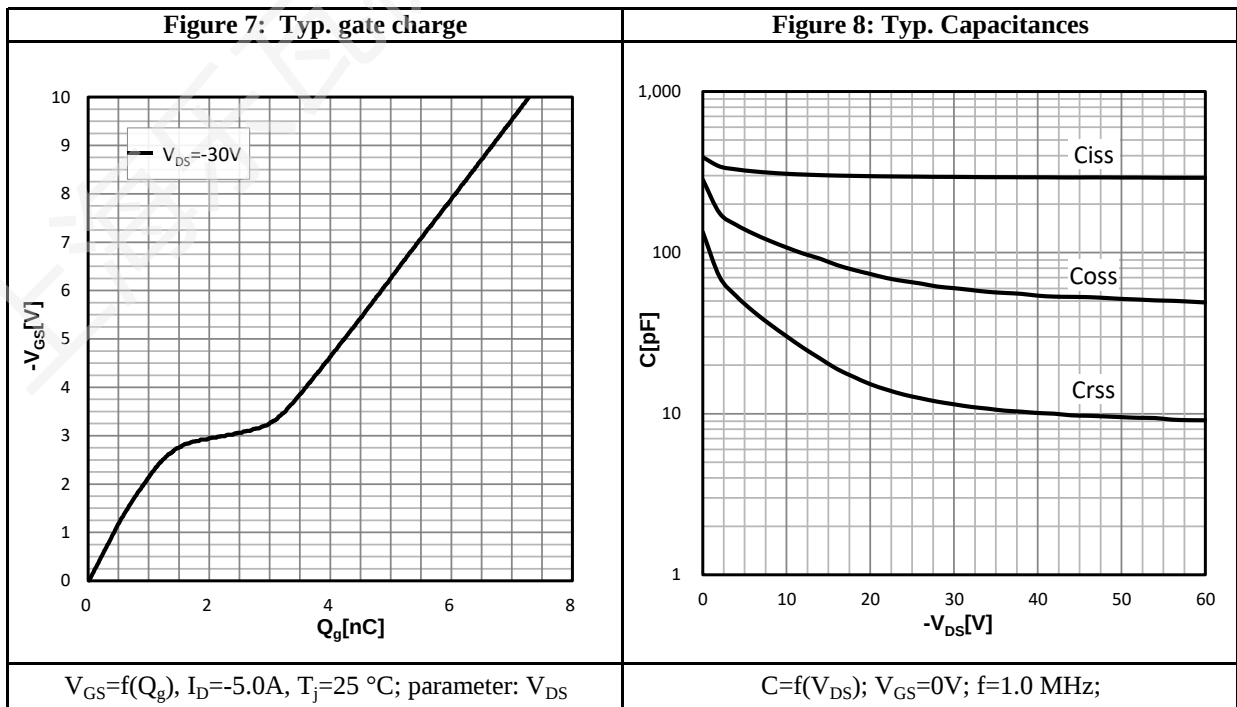
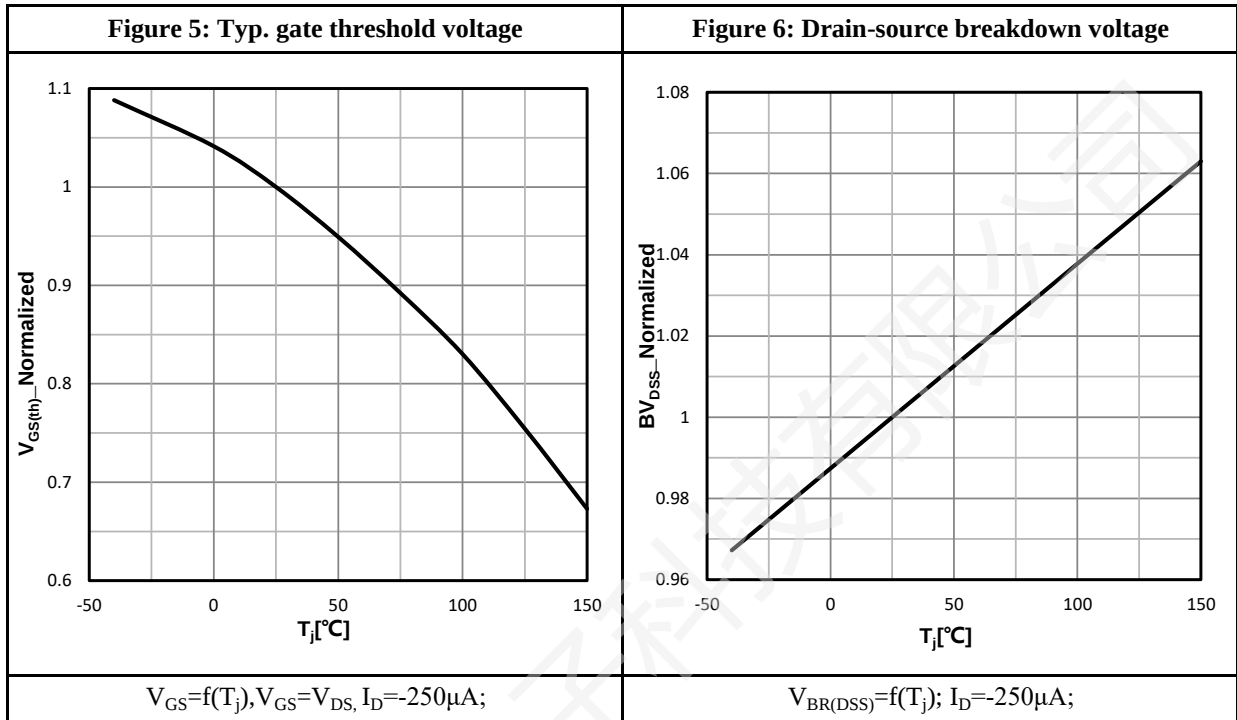
| Source-Drain Diode Characteristics |                       |                                  |       |      |      |       |
|------------------------------------|-----------------------|----------------------------------|-------|------|------|-------|
| Symbol                             | Parameter             | Test Conditions                  | Value |      |      | Units |
|                                    |                       |                                  | Min.  | Typ. | Max. |       |
| $I_S$                              | Diode Forward Current | $T_A=25\text{ }^{\circ}\text{C}$ | --    | --   | -4.0 | A     |
| $I_{SM}$                           | Diode Pluse Current   |                                  | --    | --   | -16  | A     |
| $V_{SD}$                           | Diode Forward Voltage | $I_S=-5.0A, V_{GS}=0V$           | --    | --   | -1.2 | V     |

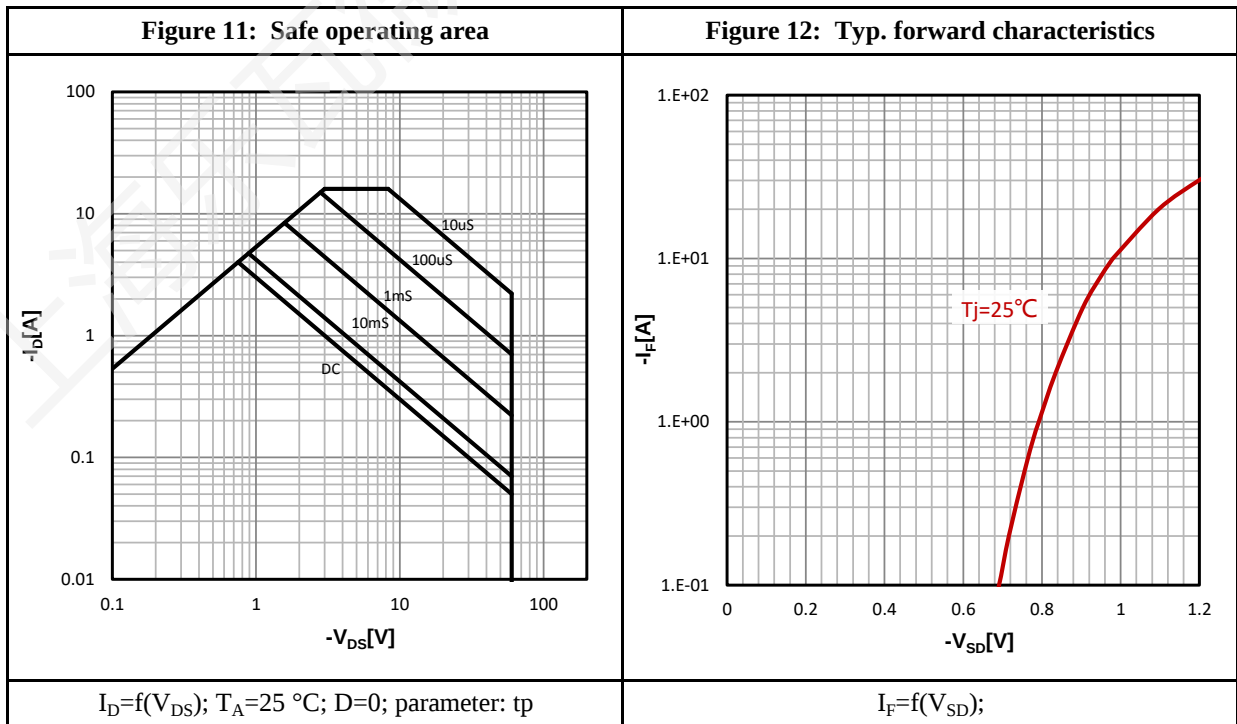
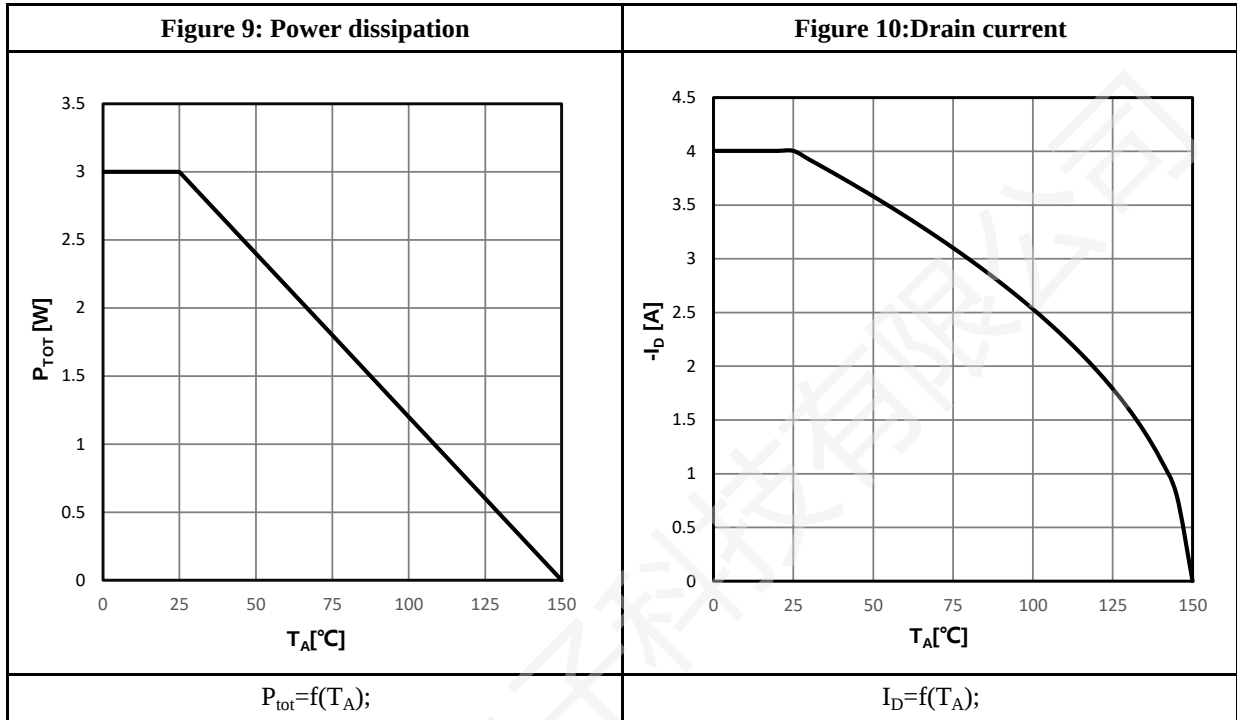
a1: Repetitive rating; pulse width limited by maximum junction temperature

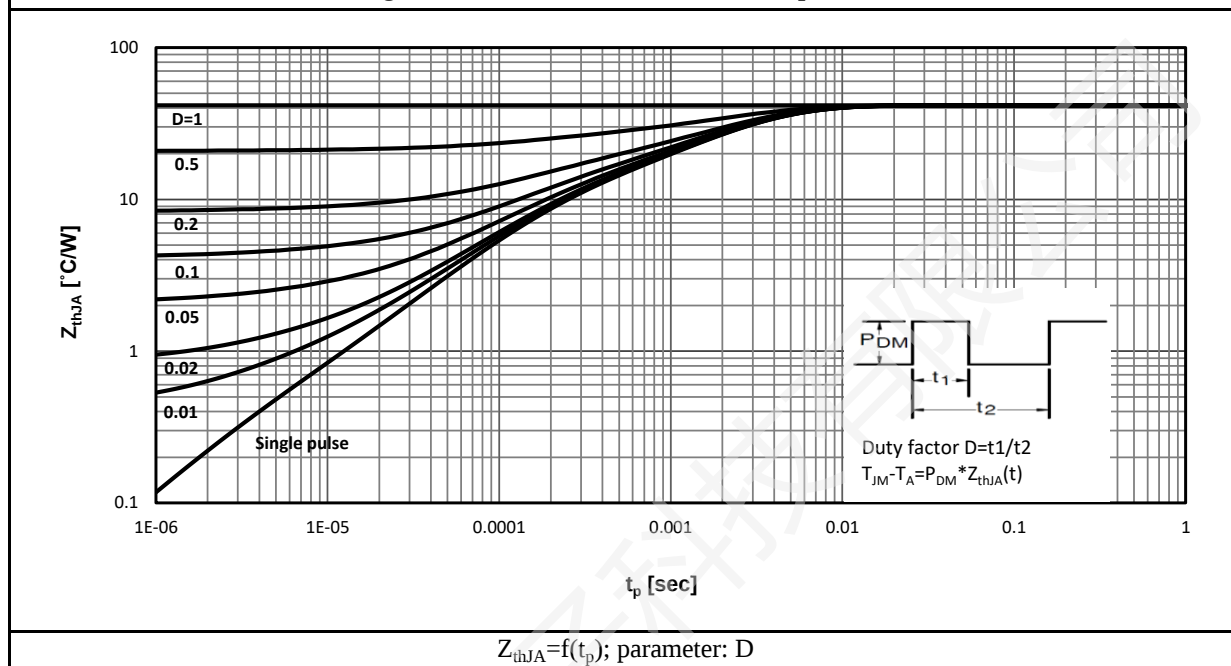
a2:  $V_{DD}=-30V, L=0.1mH, R_G=25\Omega$ , Starting  $T_J=25^{\circ}\text{C}$

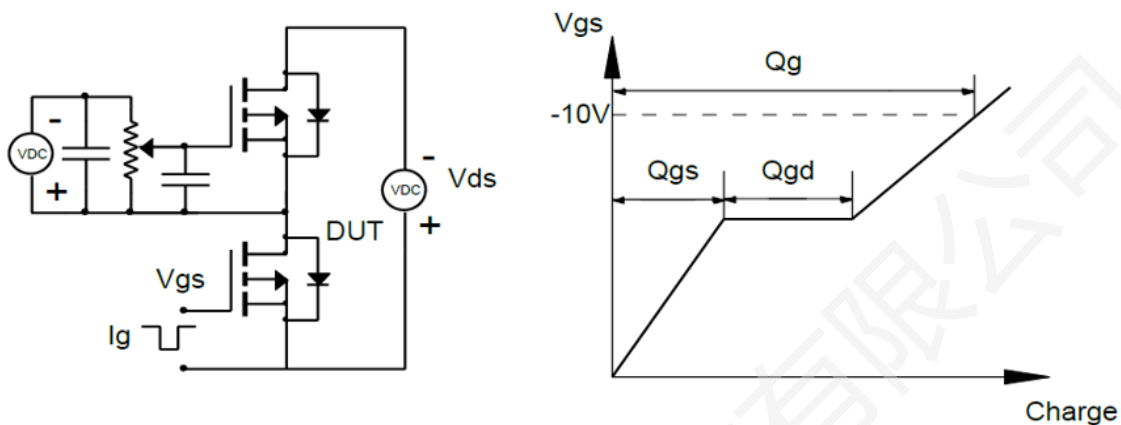
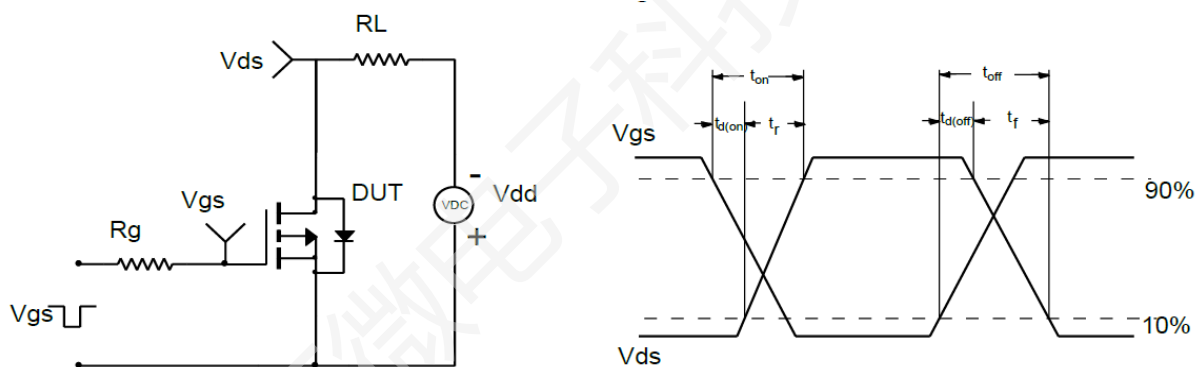
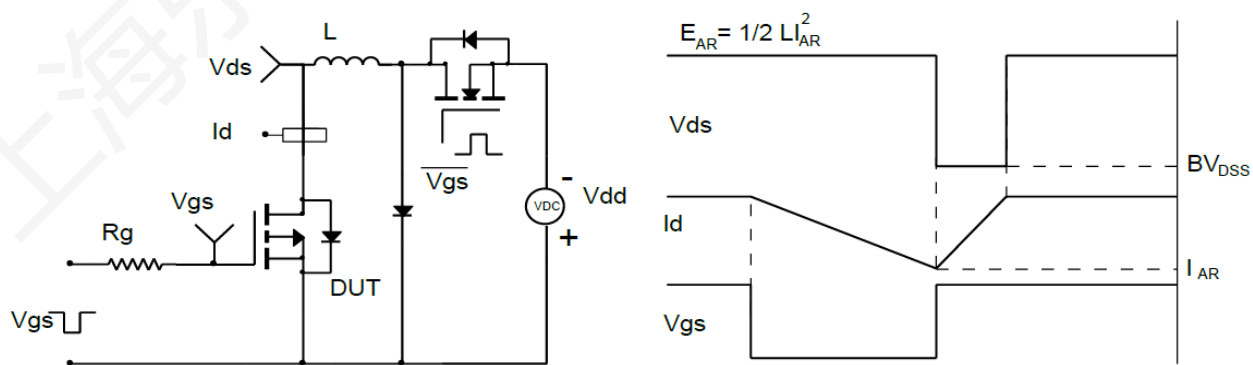
a3: Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70  $\mu\text{m}$  thick) copper area for drain connection.

**Characteristics Curve:**


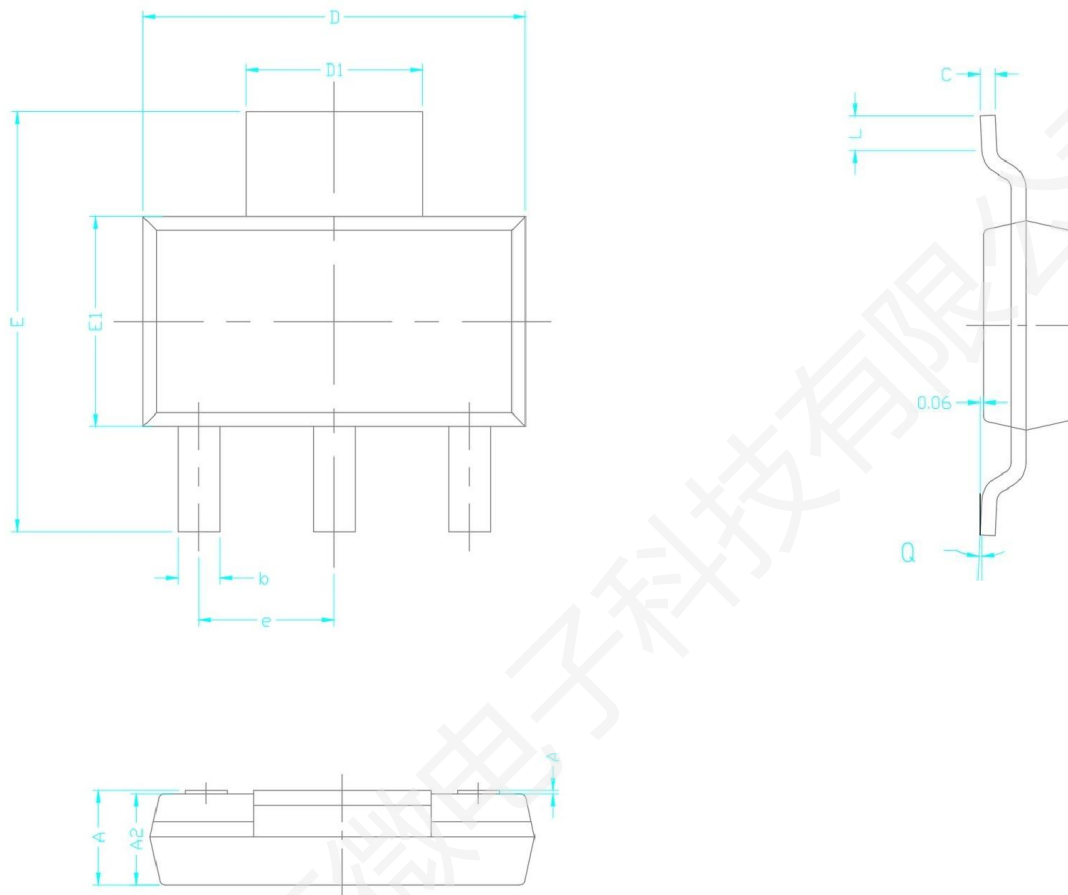




**Figure 13: Max. Transient Thermal Impedance**


**Test Circuit & Waveform:**

**Figure 14: Gate Charge Test Circuit & Waveform**

**Figure 15: Resistive Switching Test Circuit & Waveforms**

**Figure 16: Unclamped Inductive Switching Test Circuit & Waveforms**

## Package Outline:



| COMMON DIMENSION (MM) |           |       |       |
|-----------------------|-----------|-------|-------|
| PKG                   | TO-223    |       |       |
| Symbol                | MIN       | NOM   | MAX   |
| A                     | 1.520     | 1.580 | 1.720 |
| A1                    | 0.010     | 0.060 | 0.150 |
| A2                    | 1.470     | 1.520 | 1.570 |
| b                     | 0.660     | 0.710 | 0.800 |
| C                     | 0.250     | 0.280 | 0.350 |
| D                     | 6.500     | 6.600 | 6.750 |
| D1                    | 2.900     | 3.000 | 3.100 |
| E                     | 6.700     | 7.000 | 7.300 |
| E1                    | 3.300     | 3.500 | 3.700 |
| L                     | 0.750 REF |       |       |
| e                     | 2.300 REF |       |       |
| Q                     | 0°        | 4°    | 10°   |

**Revision History:**

| Revision | Date     | Descriptions    |
|----------|----------|-----------------|
| Rev 1.0  | Sep.2025 | Initial Version |

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