# CRMLTU2302B

## N-Channel 20V, 47mΩ Typ. Power MOSFET

## Description

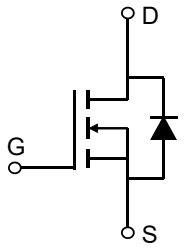
### Features

- 20V, 3A

  $R_{DS(ON)}$ Typ = 47mΩ @ $V_{GS}$ = 4.5V

  $R_{DS(ON)}$ Typ = 59mΩ @ $V_{GS}$ = 2.5V

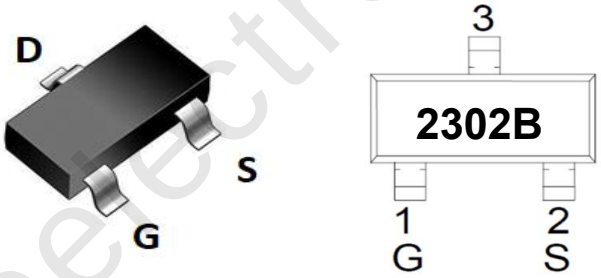
  $R_{DS(ON)}$ Typ = 75mΩ @ $V_{GS}$ = 1.8V
- Advanced Trench Technology
- Excellent $R_{DS(ON)}$ and Low Gate Charge
- Lead Free




**Schematic Diagram**

### Application

- Load Switch
- PWM Application
- Power Management




**Marking and Pin Assignment**

### Package Marking and Ordering Information

| Device | Marking | Package | Outline | Reel Size | Reel (pcs) | Per Carton (pcs) |
|---|---|---|---|---|---|---|
| CRMLTU2302B | 2302B | SOT-23 | TAPING | 7" | 3000 | 120000 |

### Absolute Maximum Ratings (@ $T_J$ = 25°C unless otherwise specified)

| Symbol | Parameter | | Value | Units |
|---|---|---|---|---|
| $V_{DS}$ | Drain-to-Source Voltage | | 20 | V |
| $V_{GS}$ | Gate-to-Source Voltage | | ±12 | V |
| $I_D$ | Continuous Drain Current | $T_A$ = 25°C | 3 | A |
| | | $T_A$ = 100°C | 2 | A |
| $I_{DM}$ | Pulsed Drain Current [1] | | 12 | A |
| $P_D$ | Power Dissipation | $T_A$ = 25°C | 1.2 | W |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient[2] | | 103 | °C/W |
| $T_J$, $T_{STG}$ | Junction & Storage Temperature Range | | -55 to 150 | °C |

## Electrical Characteristics ($T_J$ = 25°C unless otherwise specified)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| $V_{(BR)DSS}$ | Drain-Source Breakdown Voltage | $I_D$ = 250μA, $V_{GS}$ = 0V | 20 | - | - | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = 20V, $V_{GS}$ = 0V | - | - | 1.0 | μA |
| $I_{GSS}$ | Gate-Body Leakage Current | $V_{DS}$ = 0V, $V_{GS}$ = ±12V | - | - | ±100 | nA |
| **On Characteristics** | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA | 0.5 | 0.75 | 1.0 | V |
| $R_{DS(ON)}$ | Static Drain-Source ON-Resistance(3) | $V_{GS}$ = 4.5V, $I_D$ = 3A | - | 47 | 61 | mΩ |
| | | $V_{GS}$ = 2.5V, $I_D$ = 2A | - | 59 | 77 | mΩ |
| | | $V_{GS}$ = 1.8V, $I_D$ = 1A | - | 75 | 112 | mΩ |
| **Dynamic Characteristics** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{GS}$ = 0V, $V_{DS}$ = 10V, f = 1MHz | - | 200 | - | pF |
| $C_{oss}$ | Output Capacitance | | - | 35 | - | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | - | 28 | - | pF |
| $Q_g$ | Total Gate Charge | $V_{GS}$ = 0 to 4.5V, $V_{DS}$ = 10V, $I_D$ = 2A | - | 3 | - | nC |
| $Q_{gs}$ | Gate Source Charge | | - | 0.5 | - | nC |
| $Q_{gd}$ | Gate Drain("Miller") Charge | | - | 0.7 | - | nC |
| **Switching Characteristics** | | | | | | |
| $t_{d(on)}$ | Turn-On DelayTime | $V_{GS}$ = 4.5V, $V_{DD}$ = 10V, $I_D$= 2A, $R_{GEN}$ = 3Ω | - | 3 | - | ns |
| $t_r$ | Turn-On Rise Time | | - | 11 | - | ns |
| $t_{d(off)}$ | Turn-Off DelayTime | | - | 20 | - | ns |
| $t_f$ | Turn-Off Fall Time | | - | 8 | - | ns |
| **Drain-Source Diode Characteristics and Max Ratings** | | | | | | |
| $I_S$ | Maximum Continuous Drain to Source Diode Forward Current | | - | - | 3 | A |
| $I_{SM}$ | Maximum Pulsed Drain to Source Diode Forward Current | | - | - | 12 | A |
| $V_{SD}$ | Drain to Source Diode Forward Voltage | $V_{GS}$ = 0V, $I_S$ = 3A | - | - | 1.2 | V |
| trr | Body Diode Reverse Recovery Time | $I_F$ = 2A, di/dt = 100A/us | - | 4.3 | - | ns |
| Qrr | Body Diode Reverse Recovery Charge | | - | 0.6 | - | nC |

Notes:

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
2. $R_{\theta JA}$ is measured with the device mounted on a 1inch$^2$ pad of 2oz copper FR4 PCB
3. Pulse Test: Pulse Width≤300μs, Duty Cycle≤0.5%.

## Typical Performance Characteristics

Figure 1: Output Characteristics

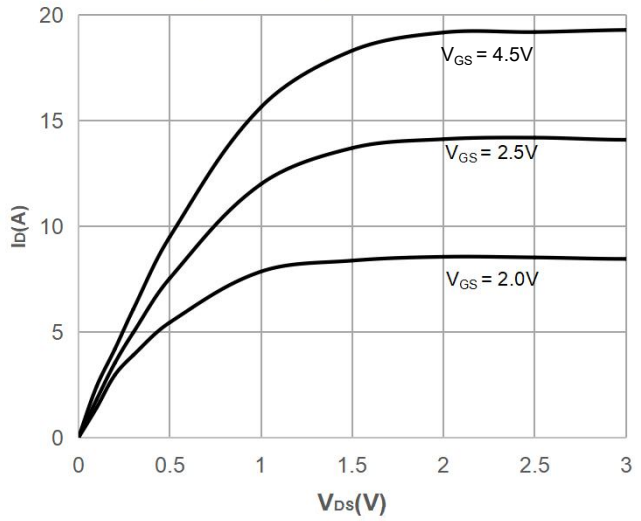



Figure 2: Typical Transfer Characteristics

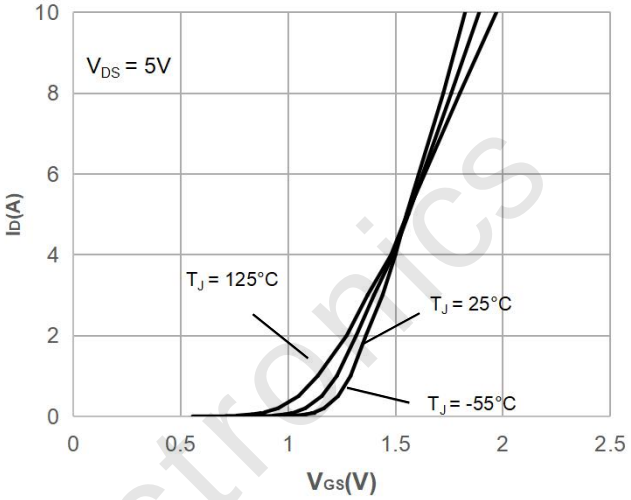



Figure 3: On-resistance vs. Drain Current

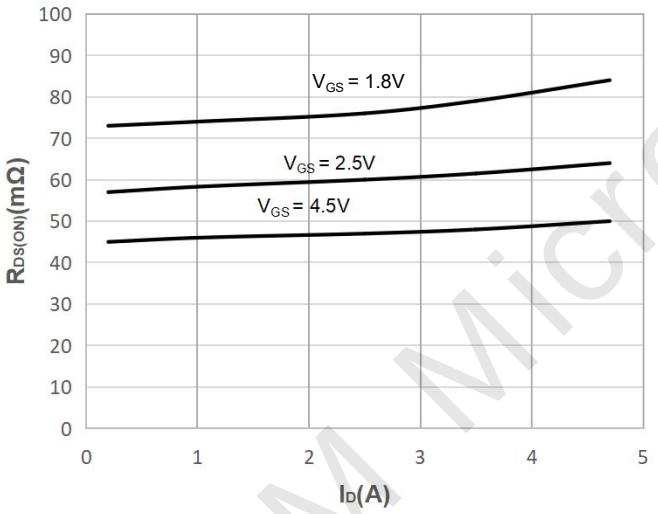



Figure 4: Body Diode Characteristics

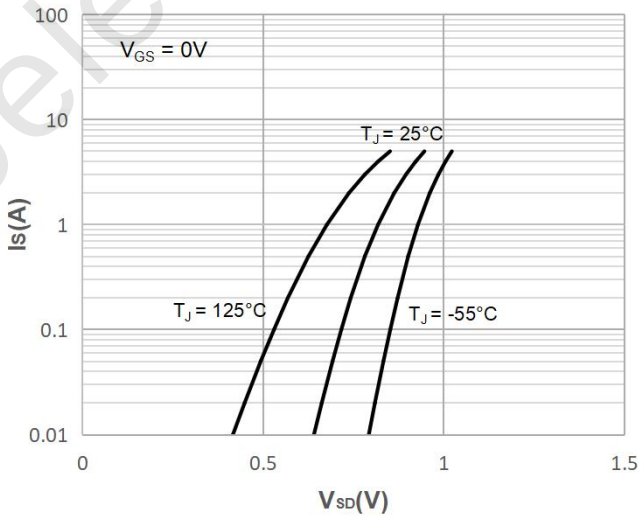



Figure 5: Gate Charge Characteristics

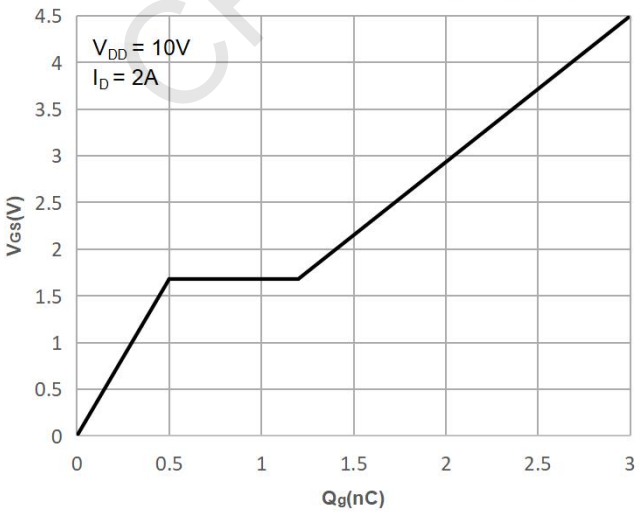
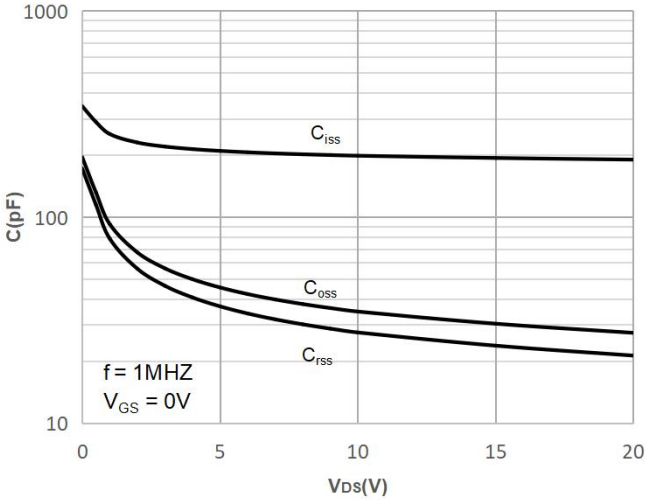



Figure 6: Capacitance Characteristics



## Typical Performance Characteristics

Figure 7: Normalized Breakdown voltage vs. Junction Temperature

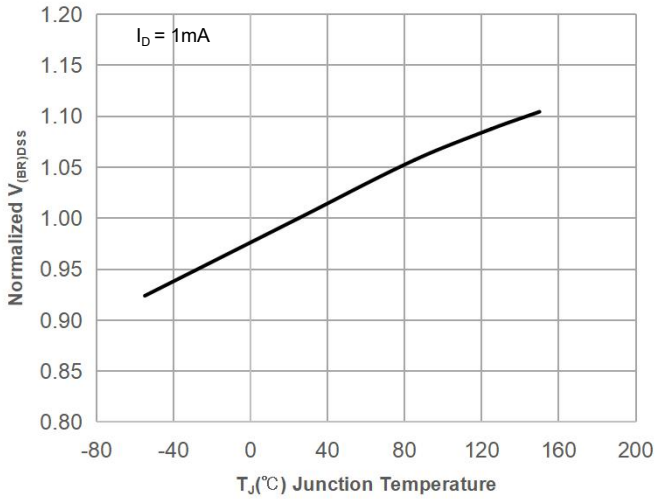



Figure 8: Normalized on Resistance vs. Junction Temperature

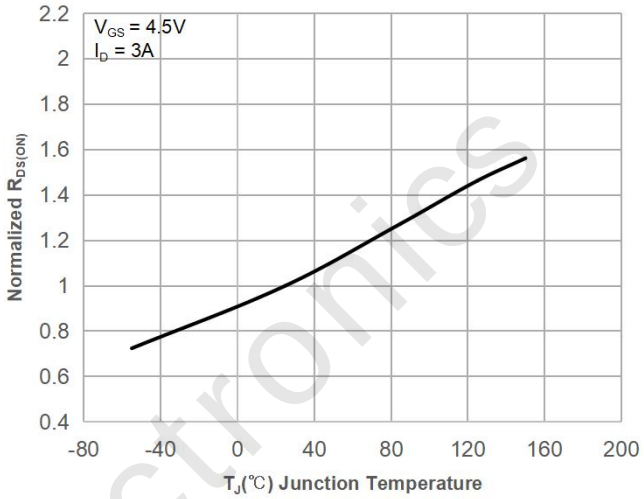



Figure 9: Maximum Safe Operating Area

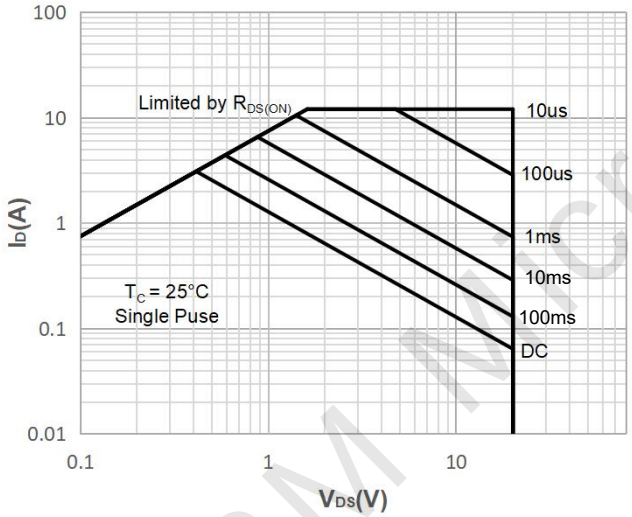



Figure 10: Maximum Continuous Drian Current vs. Case Temperature

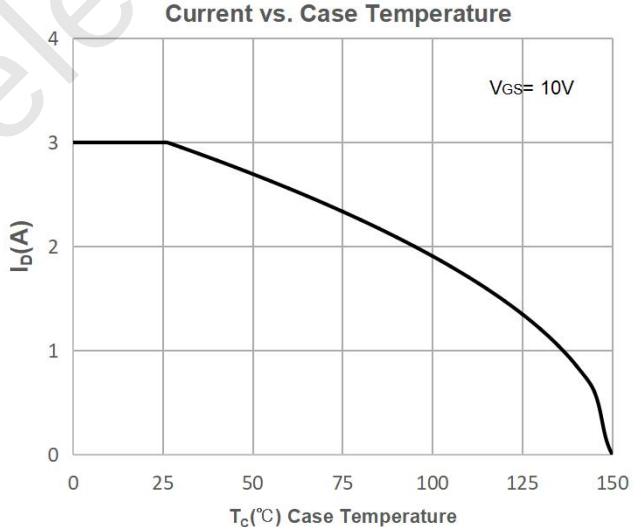



Figure 11: Normalized Maximum Transient Thermal Impedance

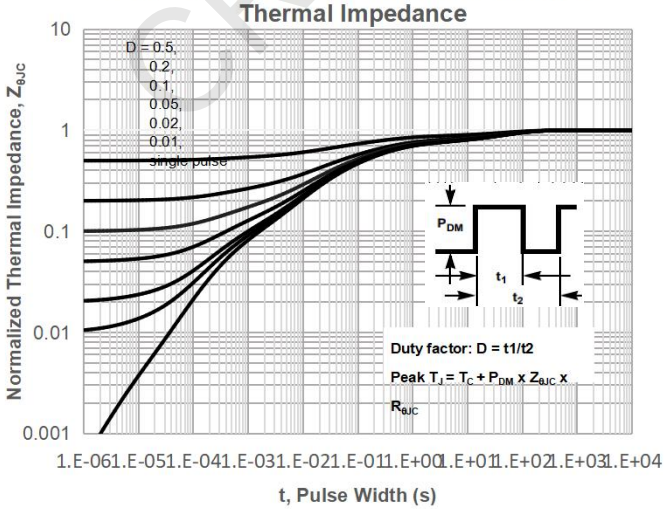
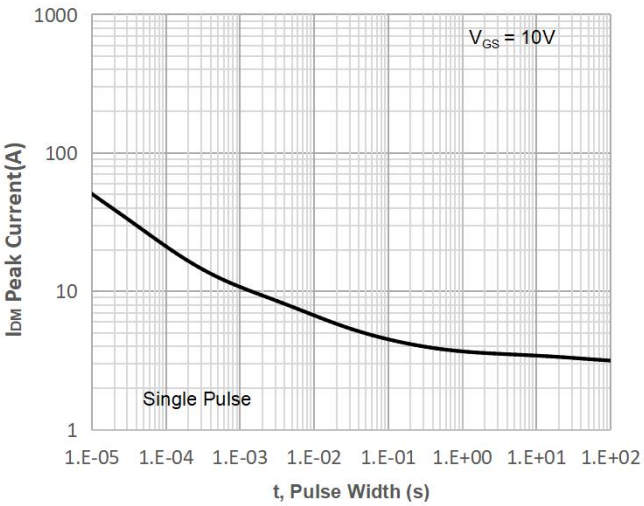



Figure 12: Peak Current Capacity



## Test Circuit

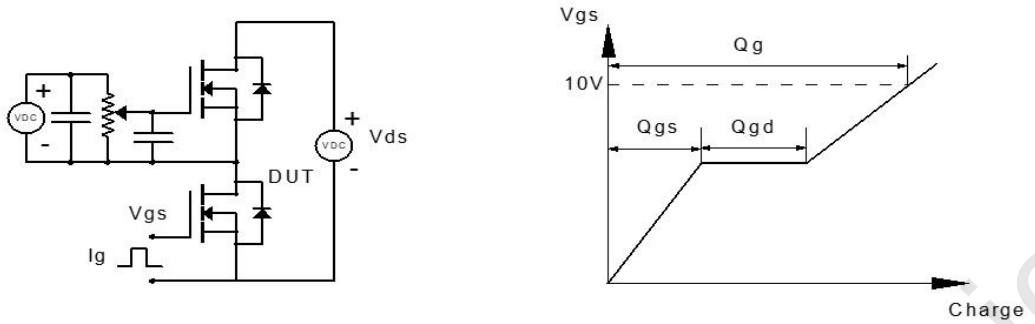



**Figure 1: Gate Charge Test Circuit & Waveform**

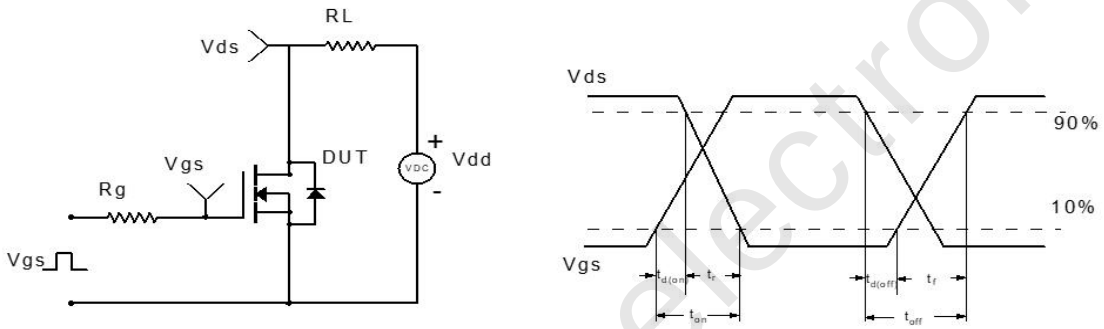



**Figure 2: Resistive Switching Test Circuit & Waveform**

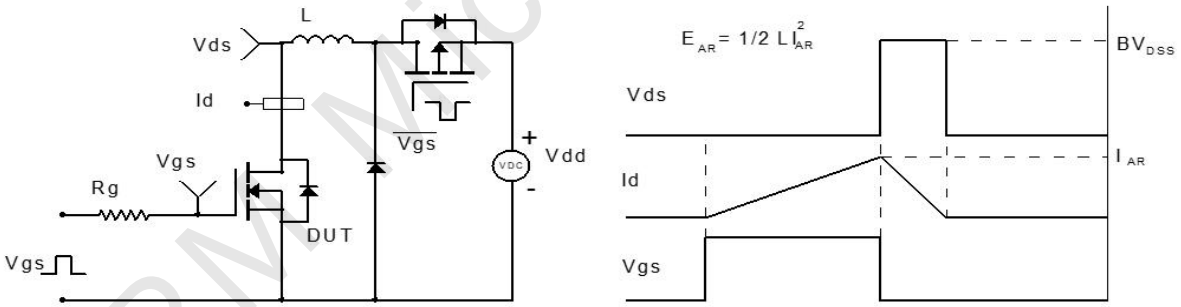



**Figure 3: Unclamped Inductive Switching Test Circuit& Waveform**

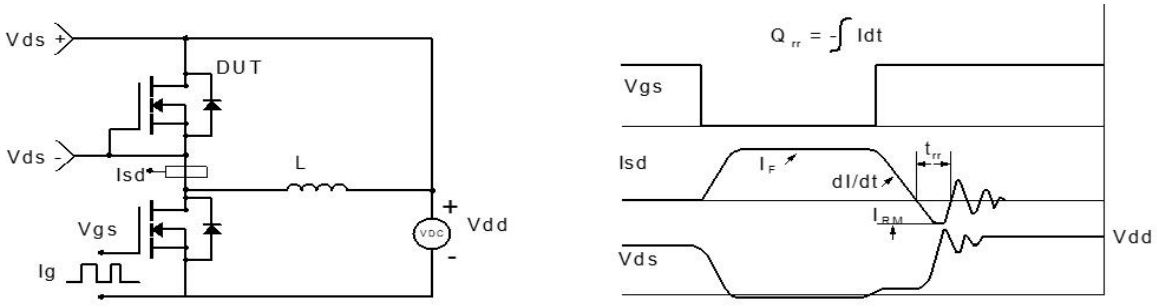
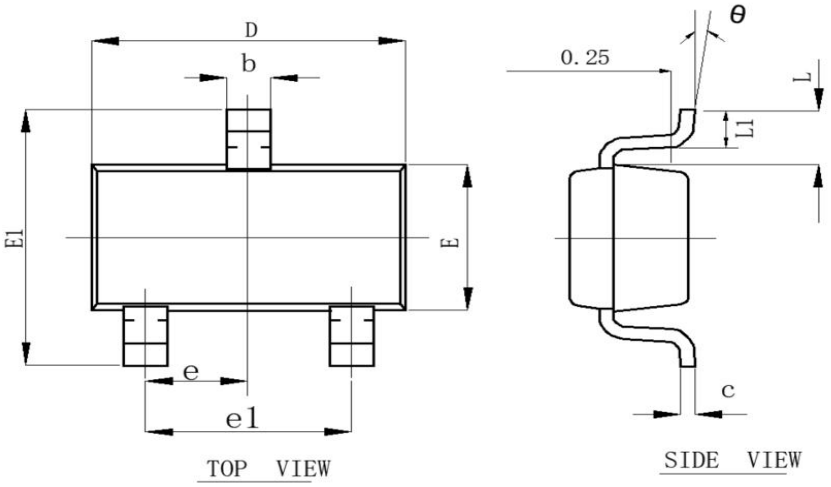
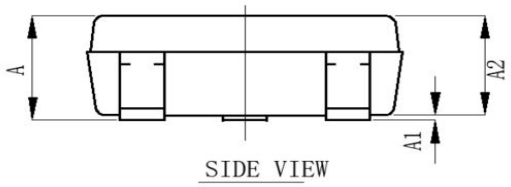



**Figure 4: Diode Recovery Test Circuit & Waveform**

## Package Mechanical Data(SOT-23)




| COMMON DIMENSIONS In Millimeters | | |
|---|---|---|
| SYMBOL | MIN | MAX |
| A | 0.900 | 1.150 |
| A1 | 0.000 | 0.100 |
| A2 | 0.900 | 1.050 |
| b | 0.300 | 0.500 |
| c | 0.080 | 0.150 |
| D | 2.800 | 3.000 |
| E | 1.200 | 1.400 |
| E1 | 2.250 | 2.550 |
| L | 0.550 REF. | |
| θ | 0° | 8° |
| L1 | 0.300 | 0.500 |
| e | 0.950 TYP. | |
| e1 | 1.800 | 2.000 |

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