# ACE634

**20V Complementary Enhancement Mode Field Effect Transistor**

## Description

The ACE634 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

- N-Channel
  $V_{DS}$(V)=20V
  $I_D$=4A
  $R_{DS(ON)}$
  <35mΩ ($V_{GS}$=4.5V)
  <42mΩ ($V_{GS}$=2.5V)
- P-Channel
  $V_{DS}$(V)=-20V
  $I_D$=-2.5A
  $R_{DS(ON)}$
  <85mΩ ($V_{GS}$=-4.5V)
  <115mΩ ($V_{GS}$=-2.5V)

## Absolute Maximum Ratings

($T_A$=25℃ Unless otherwise noted)

| Parameter | | Symbol | Typical | | Unit |
|---|---|---|---|---|---|
| | | | N-Channel | P-Channel | |
| Drain-Source Voltage | | $V_{DSS}$ | 20 | -20 | V |
| Gate-Source Voltage | | $V_{GSS}$ | ±12 | ±12 | V |
| Continuous Drain Current ($T_J$=150℃) *AC | $T_A$=25℃ | $I_D$ | 4 | -2.5 | A |
| | $T_A$=70℃ | | 3.2 | -2 | |
| Drain Current (pulse) * B | | $I_{DM}$ | 13 | -13 | A |
| Power Dissipation | $T_A$=25℃ | $P_D$ | 1.1 | 1.1 | W |
| | $T_A$=70℃ | | 0.7 | 0.7 | |
| Operating Junction Temperature | | $T_J$ | -55 to 150 | | °C |
| Storage Temperature Range | | $T_{STG}$ | -55 to 150 | | °C |

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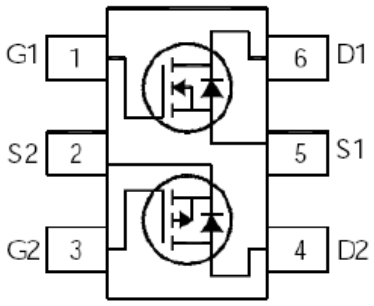
**20V Complementary Enhancement Mode Field Effect Transistor**

## Packaging Type

SOT-23-6




## Ordering information

ACE634 XX + H

- H: Halogen - free
- +: Pb - free
- XX: GM : SOT-23-6

## Electrical Characteristics (N-Channel)

($T_A$=25℃ Unless otherwise noted)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Static | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}$=0V, $I_D$=250uA | 20 | | | V |
| Drain-Source On Resistance | $R_{DS(ON)}$ | $V_{GS}$=4.5V, $I_D$=3.5A | | 29 | 35 | mΩ |
| | | $V_{GS}$=2.5V, $I_D$=2.5A | | 35 | 42 | |
| | | $V_{GS}$=1.8V, $I_D$=2A | | 62 | 75 | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=250uA | 0.6 | 0.75 | 1 | V |
| Gate Leakage Current | $I_{GSS}$ | $V_{DS}$=0V, $V_{GS}$=±12V | | | 100 | nA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=20V, $V_{GS}$=0V | | | 1 | uA |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$=5V, $I_D$=3A | | 16 | | S |
| Diode Forward Voltage | $V_{SD}$ | $I_{SD}$=1.7A, $V_{GS}$=0V | | 0.74 | 1.0 | V |
| Maximum Body-Diode Continuous Current | $I_S$ | | | | 1.7 | A |
| Switching | | | | | | |
| Total Gate Charge | $Q_g$ | $V_{DS}$=10V, $V_{GS}$=4.5V, $I_D$=4A | | 6.3 | 8.1 | nC |
| Gate-Source Charge | $Q_{gs}$ | | | 1.7 | 2.2 | |
| Gate-Drain Charge | $Q_{gd}$ | | | 1.4 | 1.8 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Turn-On Delay Time | $t_{d(on)}$ | $V_{GS}$=4.5V, $V_{DS}$=10V, $I_D$=1A, $R_G$=6Ω | | 10.4 | 20.8 | ns |
| Turn-On Rise Time | $t_r$ | | | 4.4 | 8.8 | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 27.4 | 54.8 | |
| Turn- Off Rise Time | $t_f$ | | | 4.2 | 8.4 | |
| Dynamic | | | | | | |
| Input Capacitance | Ciss | $V_{GS}$=0V, $V_{DS}$=8V, f=1MHZ | | 522.3 | | pF |
| Output Capacitance | Coss | | | 98.5 | | |
| Reverse Transfer capacitance | Crss | | | 74.7 | | |

Note:

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with $T_A$=25°C. The value in any given application depends on the user's specific board design.

B: Repetitive rating, pulse width limited by junction temperature.

C: The current rating is based on the t≤ 10s junction to ambient thermal resistance rating.

## Typical Characteristics (N-Channel)

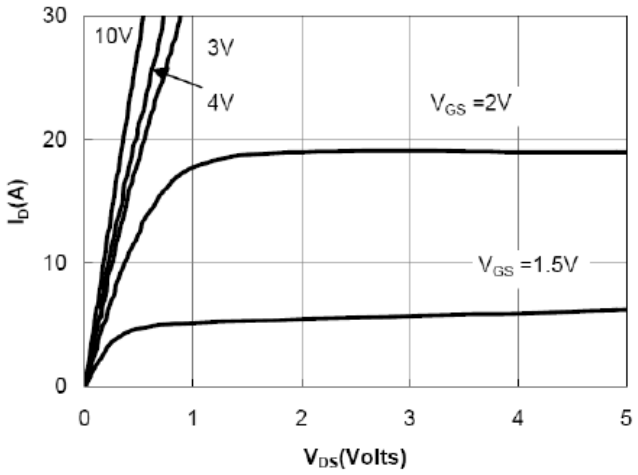



Figure 1: On-Regions Characteristics

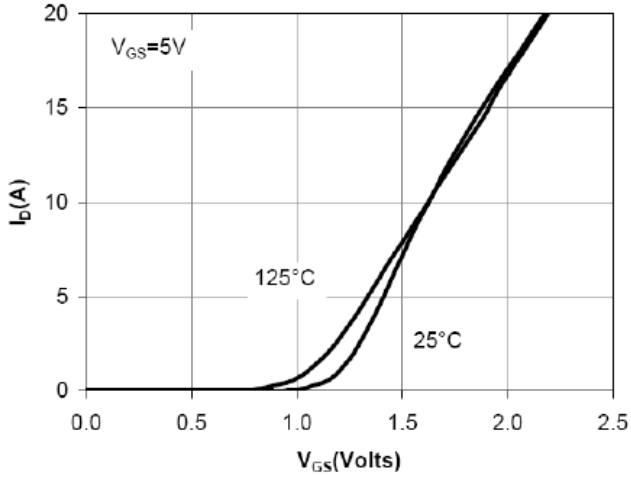



Figure 2: Transfer Characteristics

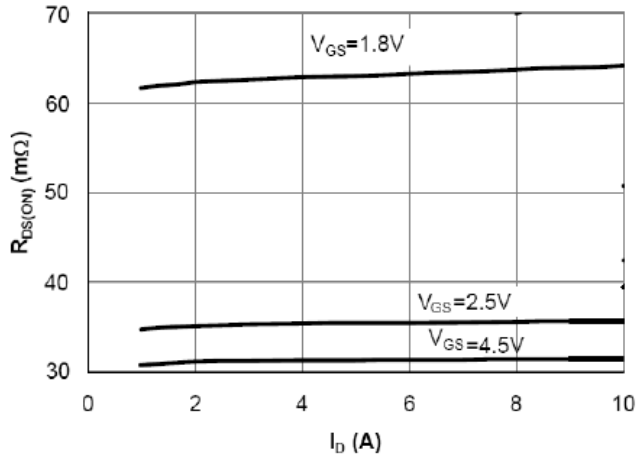



Figure 3: On-Resistance vs. Drain Current and Gate Voltage

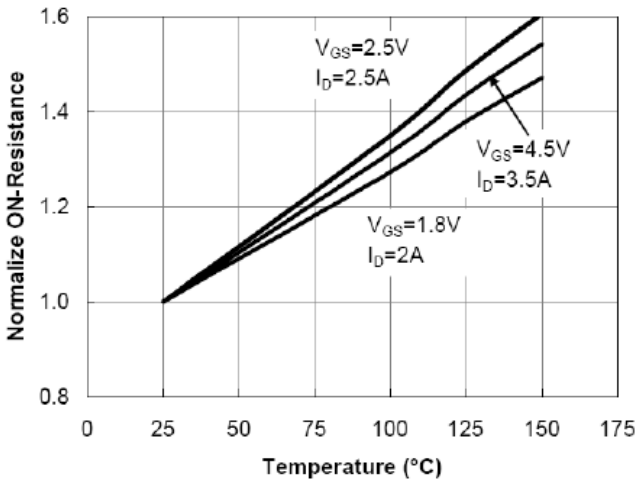



Figure 4: On-Resistance vs. Junction Temperature

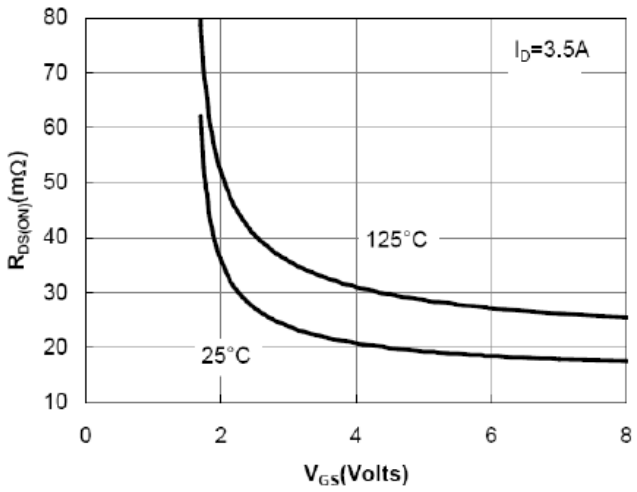


Figure 5: On-Resistance vs. Gate-Source Voltage

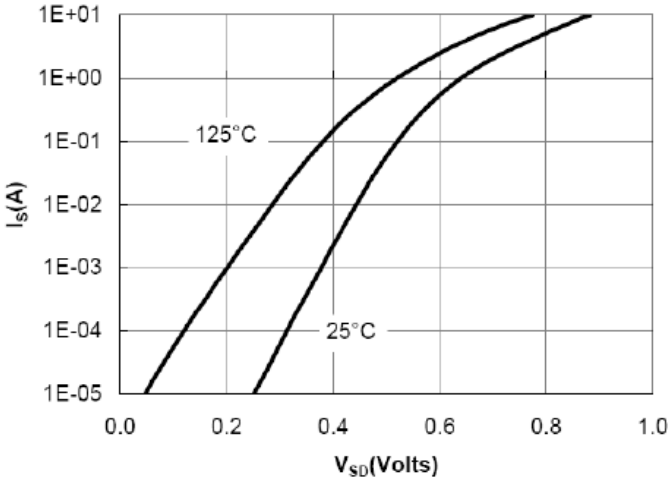


Figure 6: Body-Diode Characteristics

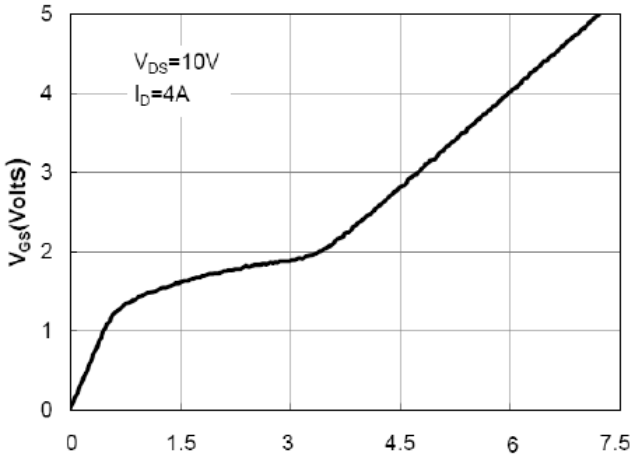


Figure 7: Gate-Charge Characteristics

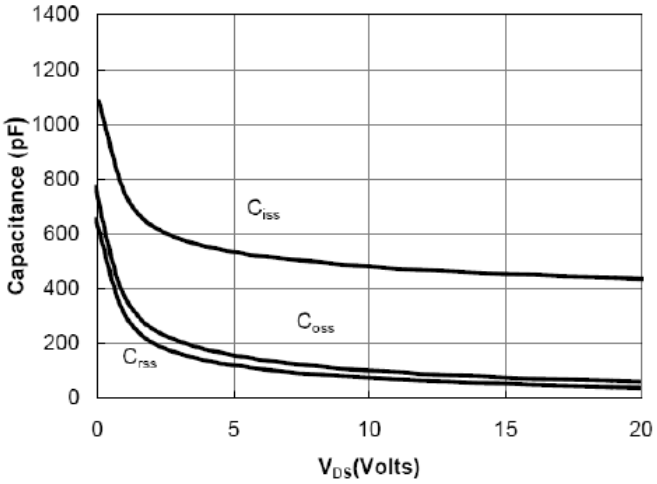


Figure 8: Capacitance Characteristics

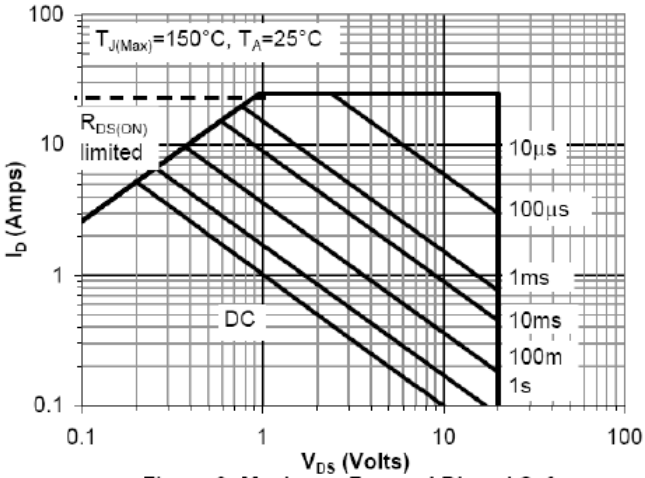


Figure 9: Maximum Forward Biased Safe Operating Area

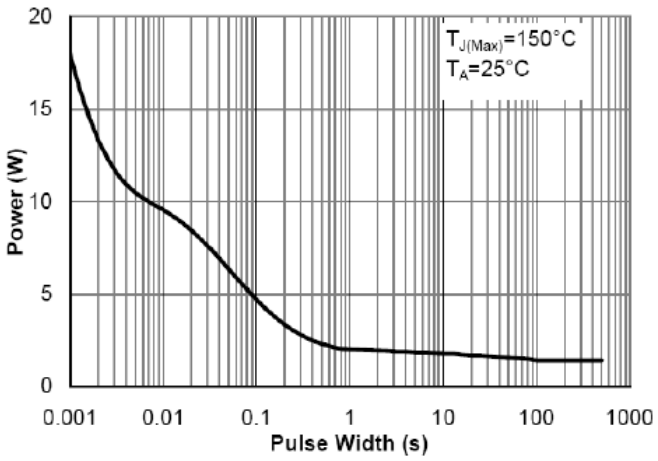


Figure 10: Single Pulse Power Rating Junction-to-Ambient

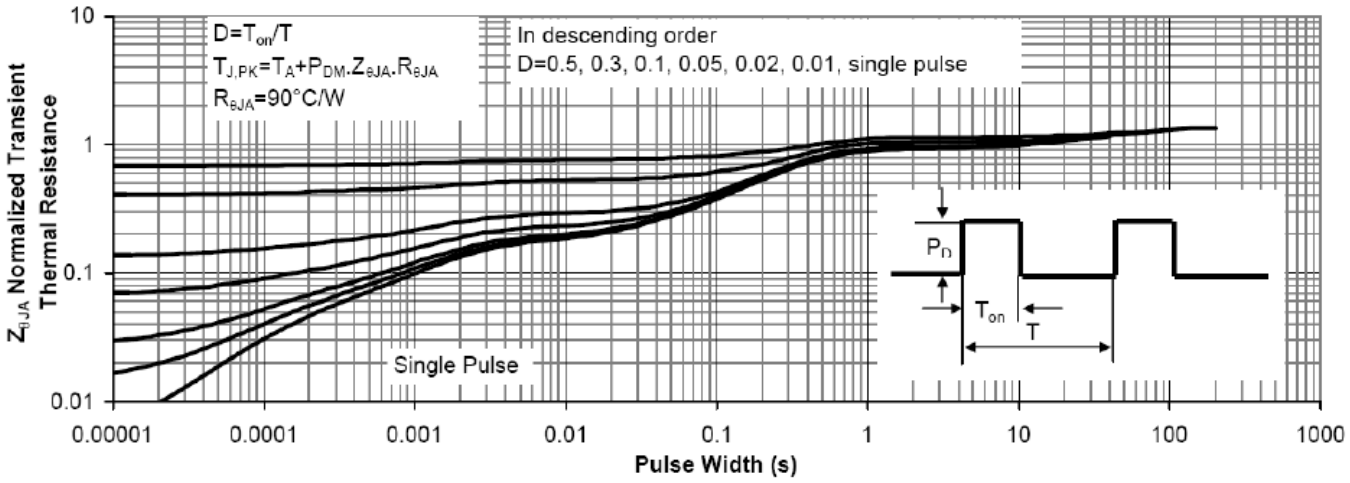



Figure 11: Normalized Maximum Transient Thermal Impedance

## Electrical Characteristics (P-Channel)

($T_A$=25℃ Unless otherwise noted)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Static | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}$=0V, $I_D$=250uA | -20 | | | V |
| Drain-Source On Resistance | $R_{DS(ON)}$ | $V_{GS}$=-4.5V, $I_D$=-2.8A | | 77 | 85 | mΩ |
| | | $V_{GS}$=-2.5V, $I_D$=-2A | | 92 | 115 | |
| | | $V_{GS}$=-1.8V, $I_D$=-2A | | 118 | 200 | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=-250uA | -0.5 | -0.6 | -1 | V |
| Gate Leakage Current | $I_{GSS}$ | $V_{DS}$=0V, $V_{GS}$=±12V | | | ±100 | nA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=-20V, $V_{GS}$=0V | | | -1 | uA |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$=-5V, $I_D$ =-2.5V | | 13 | | S |
| Diode Forward Voltage | $V_{SD}$ | $I_{SD}$=-1.6A, $V_{GS}$=0V | | -0.81 | -1.0 | V |
| Maximum Body-Diode Continuous Current | $I_s$ | | | | -1.6 | A |
| Switching | | | | | | |
| Total Gate Charge | $Q_g$ | $V_{DS}$=-6V, $V_{GS}$=-4.5V, $I_D$=-2.8A | | 6.6 | 8.6 | nC |
| Gate-Source Charge | $Q_{gs}$ | | | 0.3 | 0.4 | |
| Gate-Drain Charge | $Q_{gd}$ | | | 1.3 | 1.7 | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD}$=-6V, $R_G$=6Ω, $R_L$=6Ω, $V_{GEN}$=-4.5V, $I_D$=-1A, | | 9.7 | 19.4 | ns |
| Turn-On Rise Time | $t_r$ | | | 3.6 | 7.1 | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 33.3 | 66.6 | |
| Turn- Off Rise Time | $t_f$ | | | 4.5 | 9 | |
| Dynamic | | | | | | |
| Input Capacitance | Ciss | $V_{GS}$=0V, $V_{DS}$=-6V, f=1MHZ | | 589 | | pF |

| | | | | | | |
|---|---|---|---|---|---|---|
| Output Capacitance | Coss | | | 91.2 | | |
| Reverse Transfer capacitance | Crss | | | 67.2 | | |

Note:

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with $T_A$=25°C. The value in any given application depends on the user's specific board design.

B: Repetitive rating, pulse width limited by junction temperature.

C: The current rating is based on the t≤ 10s junction to ambient thermal resistance rating.

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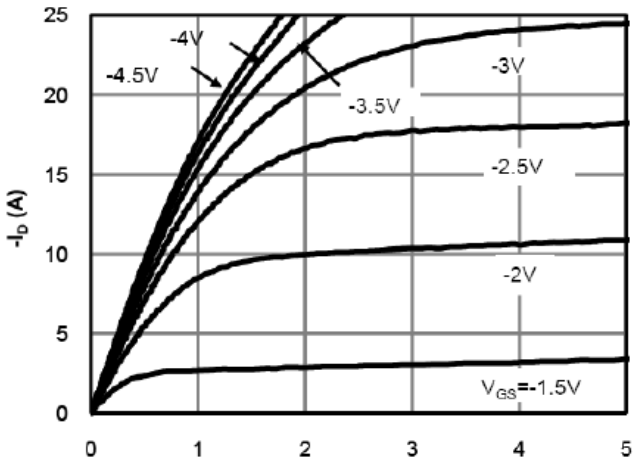


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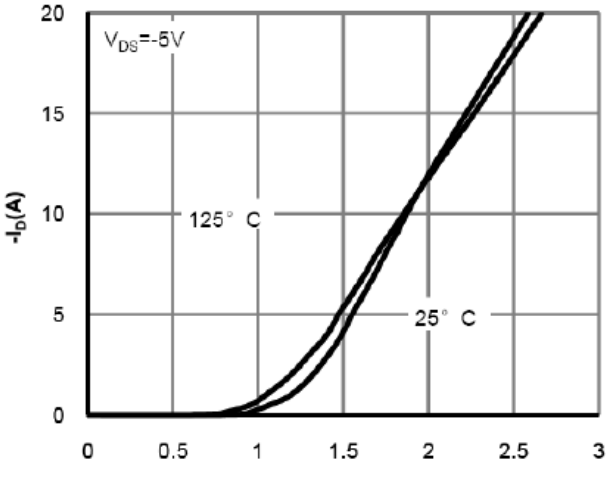


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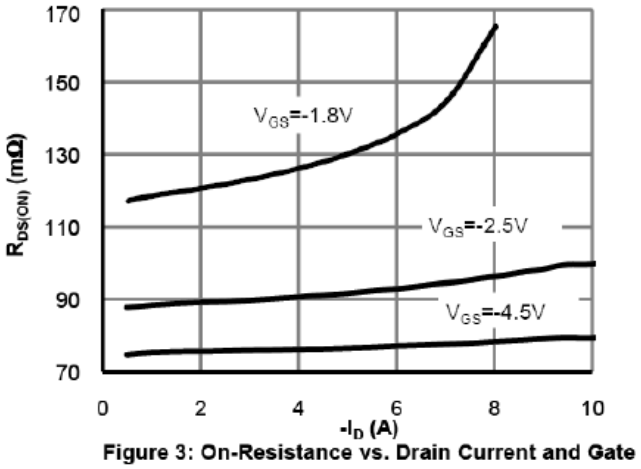


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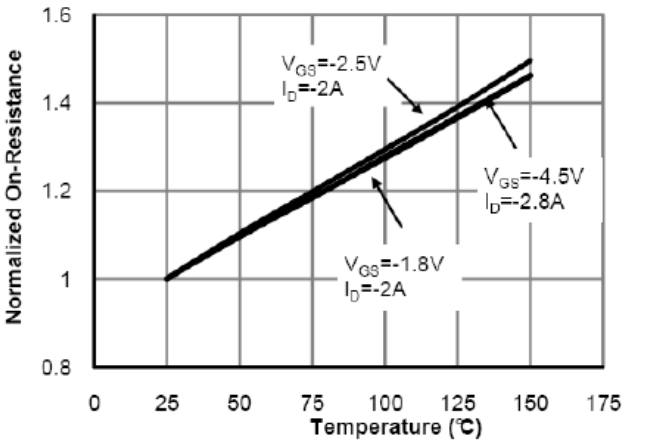


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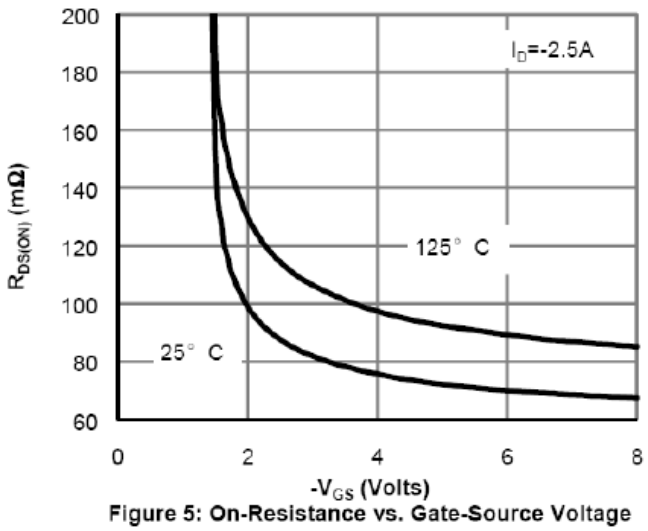

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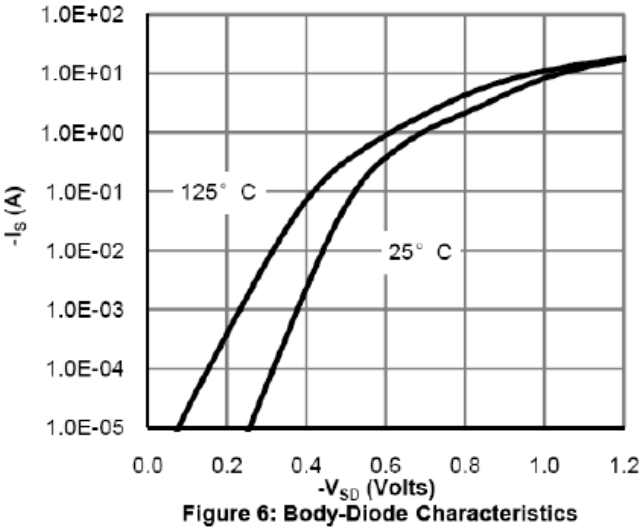

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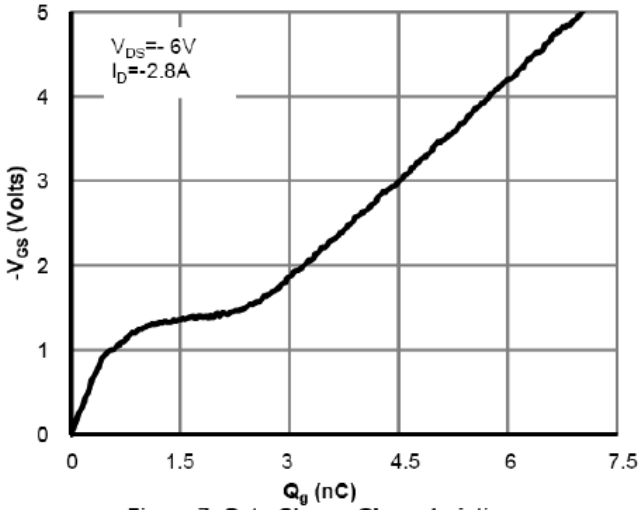

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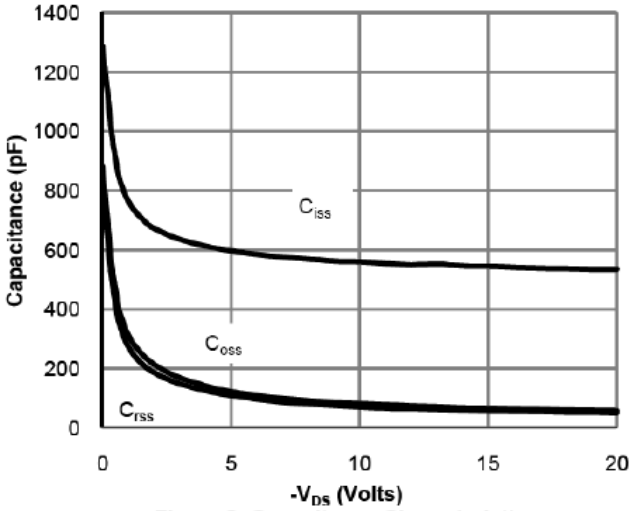

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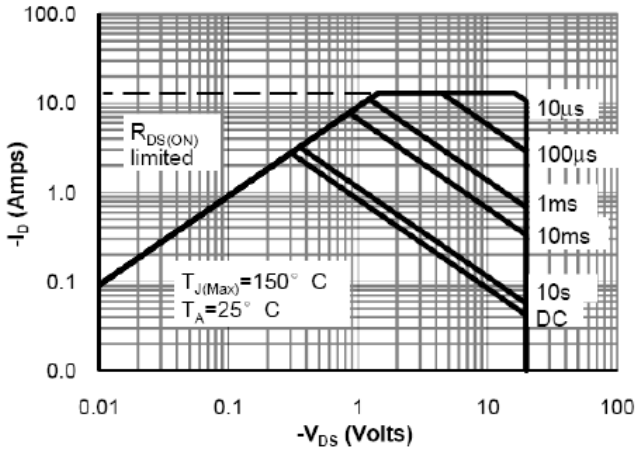

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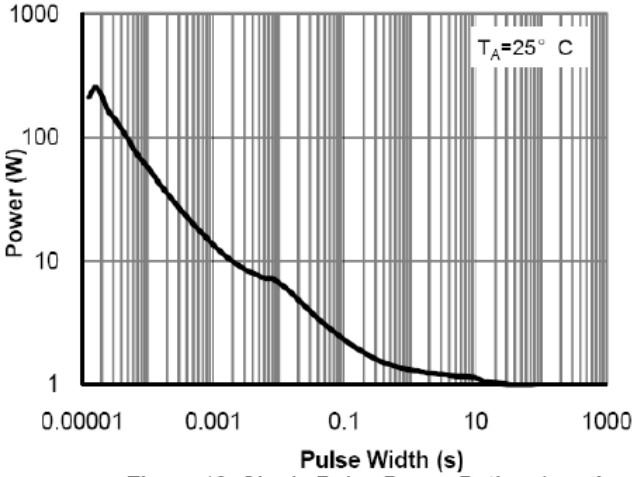

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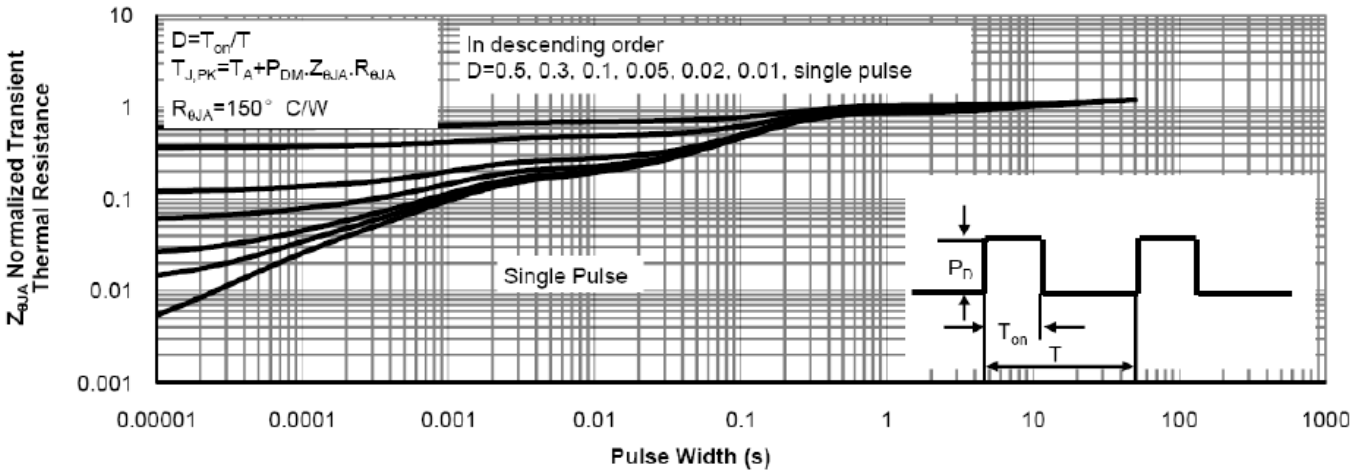
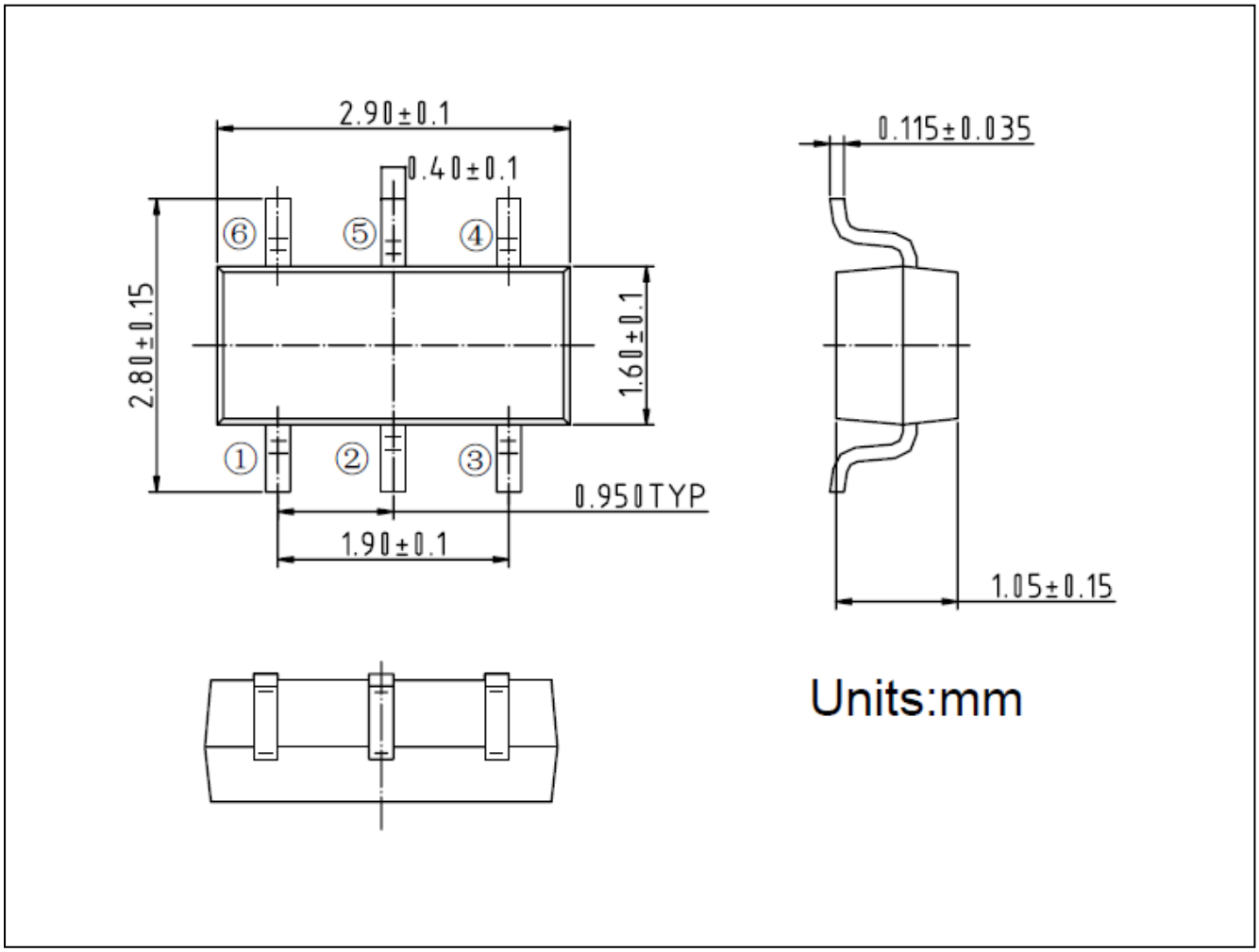



Figure 11: Normalized Maximum Transient Thermal Impedance

## Packing Information

### SOT-23-6



Notes

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1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and shoes failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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