# DUAL N-CHANNEL ENHANCEMENT MODE MOSFET

## Product Summary

| $BV_{DSS}$ | $R_{DS(ON)}$ | $I_D$ @$T_A$ = +25°C |
|---|---|---|
| 20V | 0.99Ω @ $V_{GS}$ = 4.5V | 0.7A |
| | 1.2Ω @ $V_{GS}$ = 2.5V | 0.6A |

## Features and Benefits

- Low On-Resistance
- Low Gate Threshold Voltage $V_{GS(TH)}$ < 1V
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- Ultra-Small Surface-Mount Package
- ESD Protected Gate
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **The DMN2991UVQ is suitable for automotive applications requiring specific change control; this part is AEC-Q101 qualified, PPAP capable, and manufactured in IATF16949 certified facilities.**
  **https://www.diodes.com/quality/product-definitions/**

## Description

This new generation MOSFET has been designed to minimize the on-state resistance ($R_{DS(ON)}$) yet maintain superior switching performance, making it ideal for high-efficiency power-management applications.

## Applications

- Battery-operated systems and solid-state relays
- Drivers: relays, solenoids, lamps, hammers, displays, memories, transistors, etc.
- Power supply converter circuits

## Mechanical Data

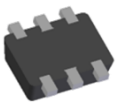
- Package: SOT563
- Package Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.006 grams (Approximate)



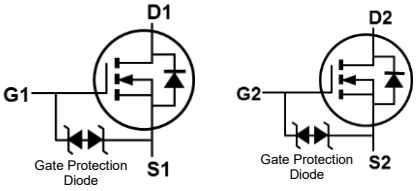

SOT563



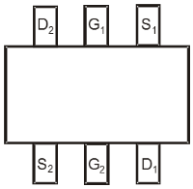
Top View



Bottom View




Internal Schematic




Top View

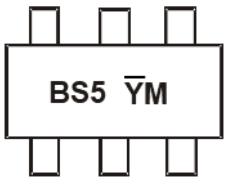
## Ordering Information (Note 4)

| Orderable Part Number | Package | Packing | |
|---|---|---|---|
| | | Qty. | Carrier |
| DMN2991UVQ-7 | SOT563 | 3000 | Tape & Reel |
| DMN2991UVQ-13 | SOT563 | 10000 | Tape & Reel |

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See https://www.diodes.com/quality/lead-free/ for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
4. For packaging details, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.


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## Marking Information




BS5 = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: N = 2026)
M = Month (ex: 9 = September)

Date Code Key

| Year | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | L | M | N | P | R | S | T | U | V | W | X | Y |

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | O | N | D |

## Maximum Ratings (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | | | Symbol | Value | Unit |
|---|---|---|---|---|---|
| Drain-Source Voltage | | | $V_{DSS}$ | 20 | V |
| Gate-Source Voltage | | | $V_{GSS}$ | ±8 | V |
| Continuous Drain Current (Note 5) $V_{GS}$ = 4.5V | Steady State | $T_A$ = +25°C<br>$T_A$ = +70°C | $I_D$ | 0.7<br>0.5 | A |
| Maximum Continuous Body Diode Forward Current (Note 5) | | | $I_S$ | 0.64 | A |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%) | | | $I_{DM}$ | 1.5 | A |

## Thermal Characteristics (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Total Power Dissipation (Note 6) | $T_A$ = +25°C | $P_D$ | 0.46 | W |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady State | $R_{\theta JA}$ | 270 | °C/W |
| Total Power Dissipation (Note 5) | $T_A$ = +25°C | $P_D$ | 0.78 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State | $R_{\theta JA}$ | 160 | °C/W |
| Operating and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to +150 | °C |

Notes: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
6. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.


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## Electrical Characteristics (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS (Note 7)** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | 20 | — | — | V | $V_{GS}$ = 0, $I_D$ = 250µA |
| Zero Gate Voltage Drain Current @$T_C$ = +25°C | $I_{DSS}$ | — | — | 1 | µA | $V_{DS}$ = 16V, $V_{GS}$ = 0 |
| Gate-Source Leakage | $I_{GSS}$ | — | — | ±10 | µA | $V_{GS}$ = ±5V, $V_{DS}$ = 0 |
| **ON CHARACTERISTICS (Note 7)** | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | 0.4 | — | 1.0 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250µA |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | — | 0.44 | 0.99 | Ω | $V_{GS}$ = 4.5V, $I_D$ = 100mA |
| | | | 0.6 | 1.2 | | $V_{GS}$ = 2.5V, $I_D$ = 50mA |
| | | | 0.7 | 1.8 | | $V_{GS}$ = 1.8V, $I_D$ = 20mA |
| Diode Forward Voltage (Note 7) | $V_{SD}$ | — | 0.7 | 1.0 | V | $V_{GS}$ = 0, $I_S$ = 150mA |
| **DYNAMIC CHARACTERISTICS (Note 8)** | | | | | | |
| Input Capacitance | $C_{iss}$ | — | 14.6 | — | pF | $V_{DS}$ = 16V, $V_{GS}$ = 0<br>f = 1.0MHz |
| Output Capacitance | $C_{oss}$ | — | 4.7 | — | pF | |
| Reverse Transfer Capacitance | $C_{rss}$ | — | 3.2 | — | pF | |
| Total Gate Charge | $Q_g$ | — | 0.28 | — | nC | $V_{GS}$ = 4.5V, $V_{DS}$ = 10V<br>$I_D$ = 250mA |
| Gate-Source Charge | $Q_{gs}$ | — | 0.04 | — | nC | |
| Gate-Drain Charge | $Q_{gd}$ | — | 0.1 | — | nC | |
| Turn-On Delay Time | $t_{D(ON)}$ | — | 7.1 | — | ns | $V_{DD}$ = 10V, $V_{GS}$ = 4.5V<br>$R_L$ = 47Ω, $R_G$ = 10Ω<br>$I_D$ = 200mA |
| Turn-On Rise Time | $t_R$ | — | 18 | — | ns | |
| Turn-Off Delay Time | $t_{D(OFF)}$ | — | 125 | — | ns | |
| Turn-Off Fall Time | $t_F$ | — | 56.9 | — | ns | |

Notes: 7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to production testing.


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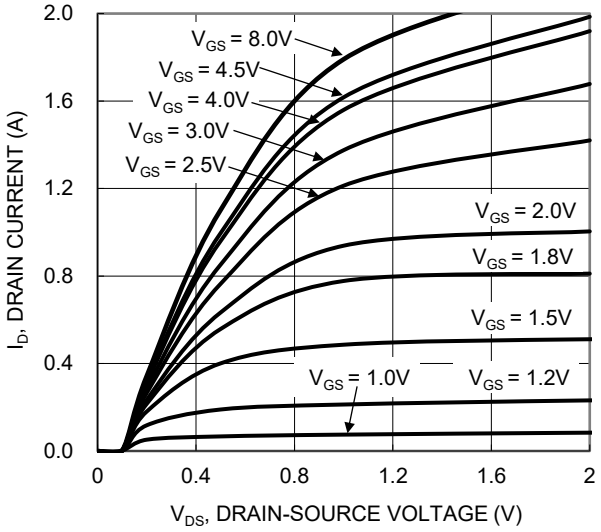



Figure 1. Typical Output Characteristic

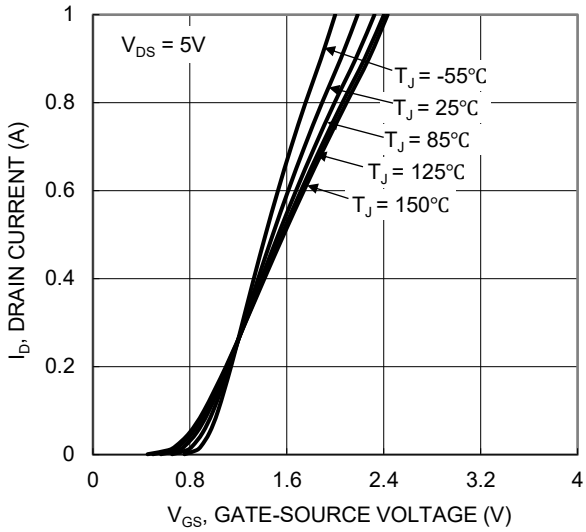



Figure 2. Typical Transfer Characteristic

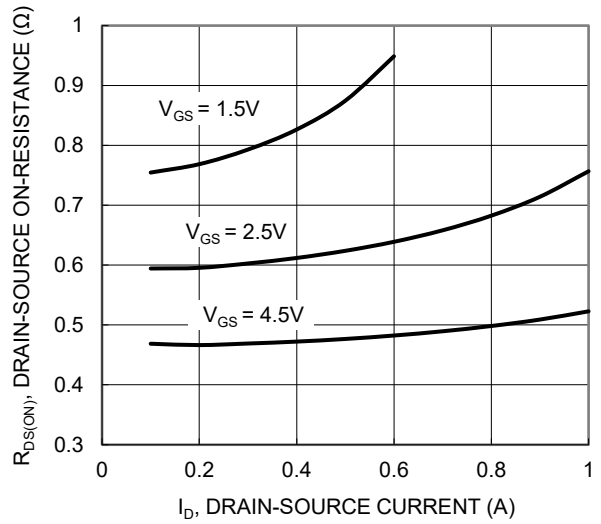



Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

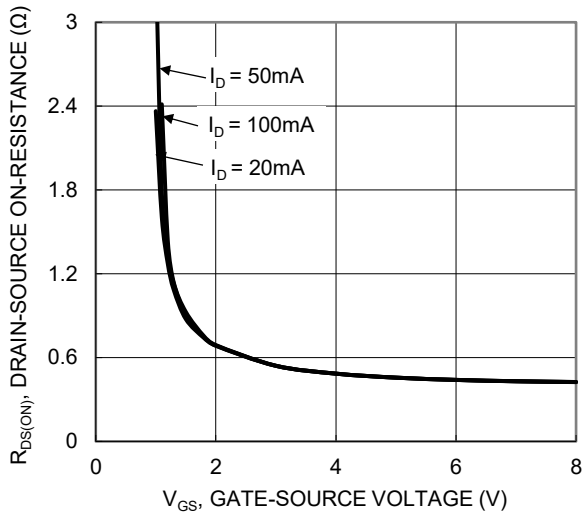



Figure 4. Typical Transfer Characteristic

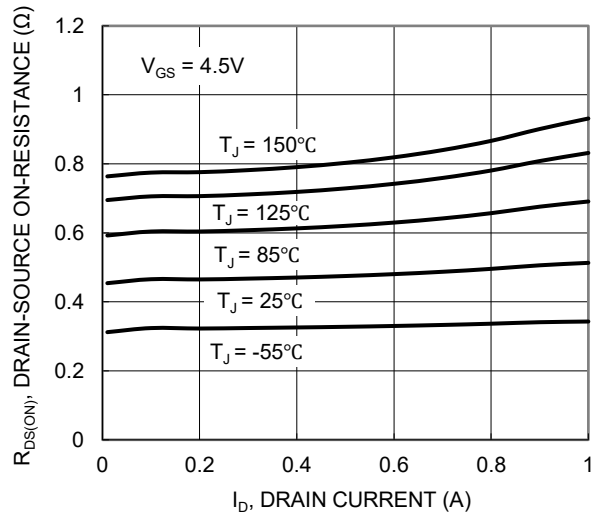



Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

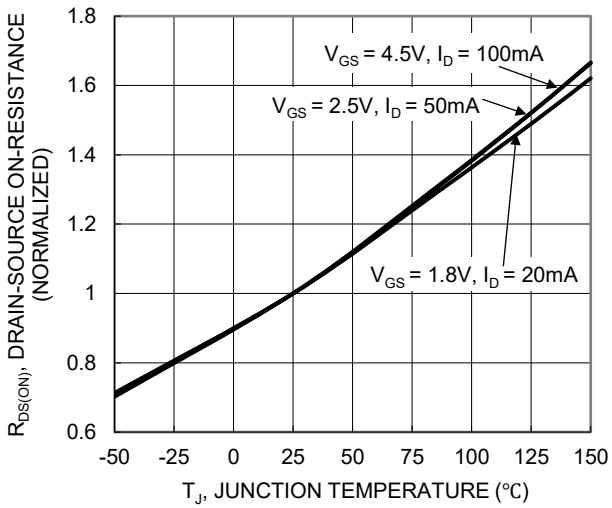



Figure 6. On-Resistance Variation with Junction Temperature


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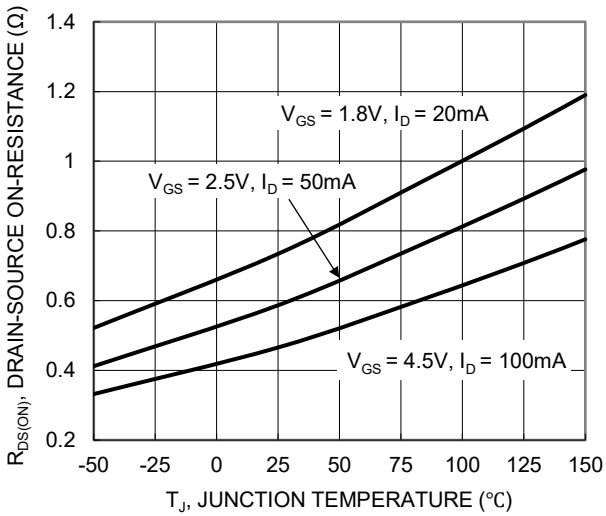



Figure 7. On-Resistance Variation with Junction Temperature

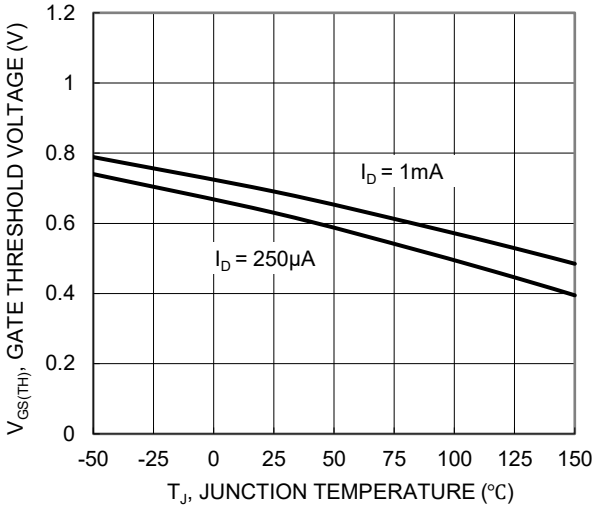



Figure 8. Gate Threshold Variation vs. Junction Temperature

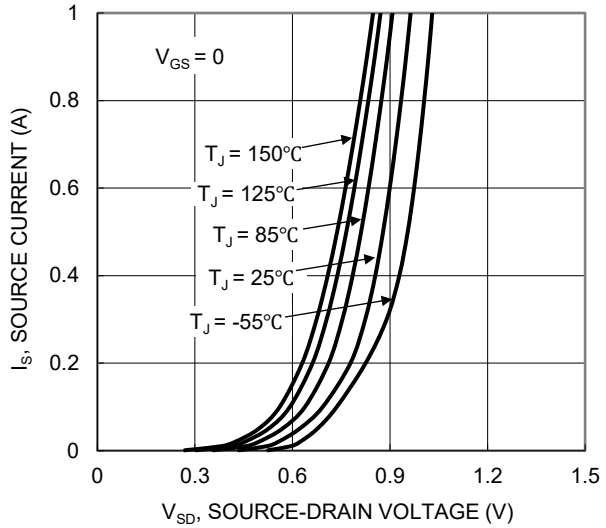



Figure 9. Diode Forward Voltage vs. Current

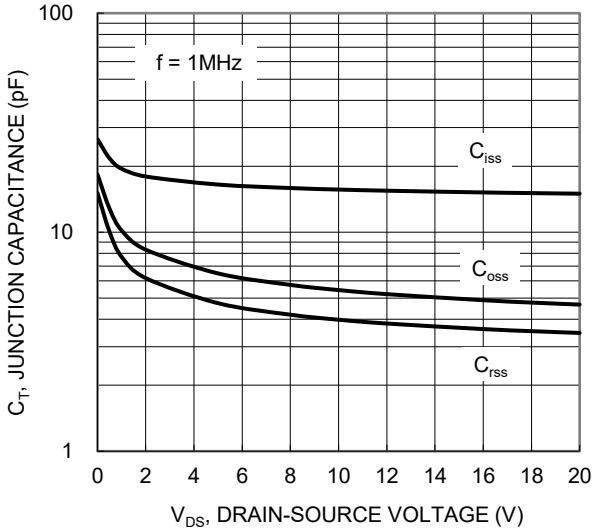



Figure 10. Typical Junction Capacitance

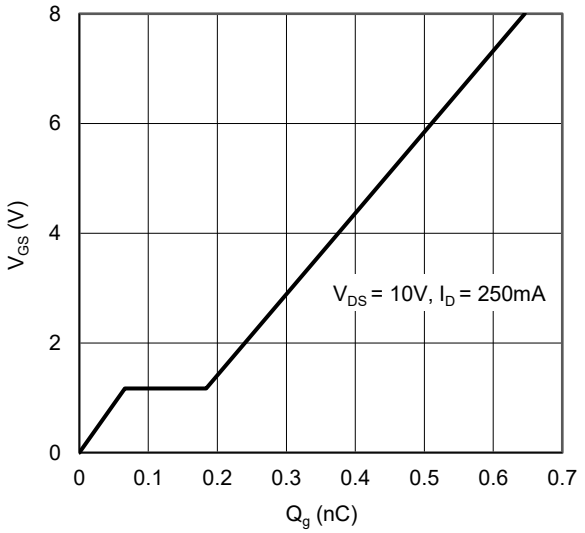



Figure 11. Gate Charge

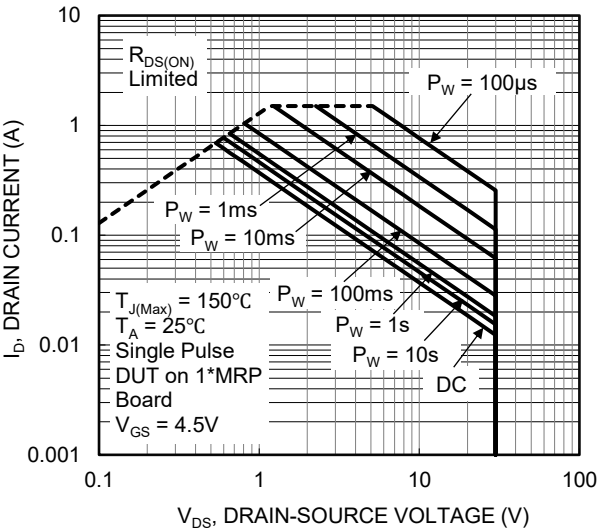



Figure 12. SOA, Safe Operation Area


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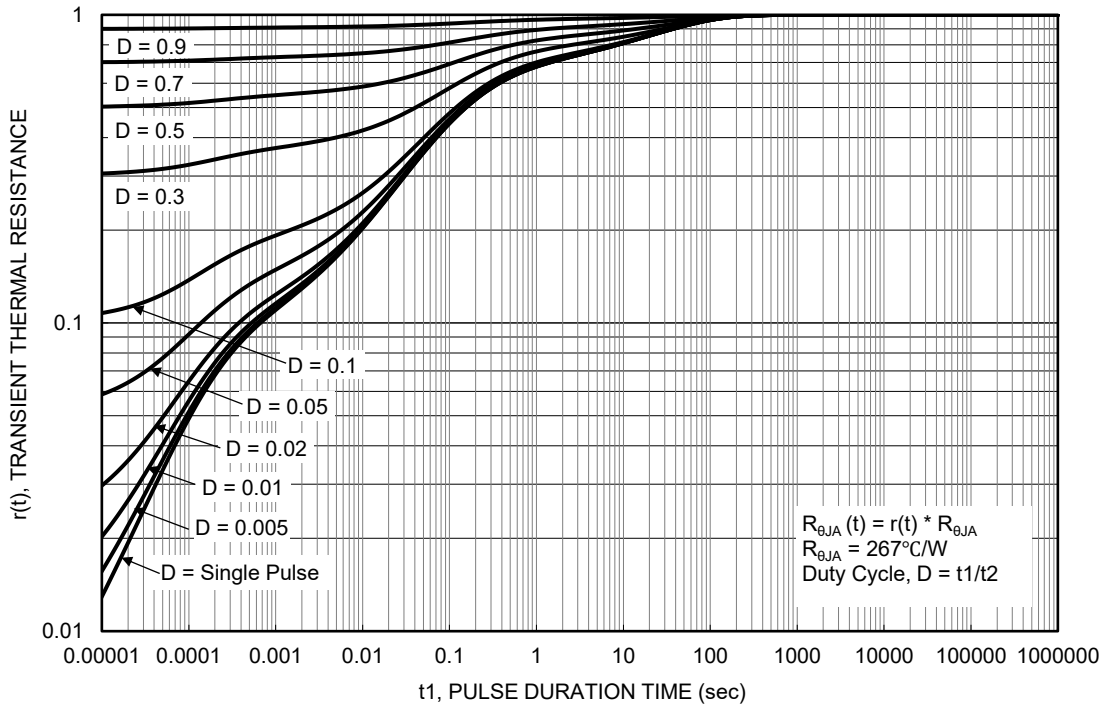


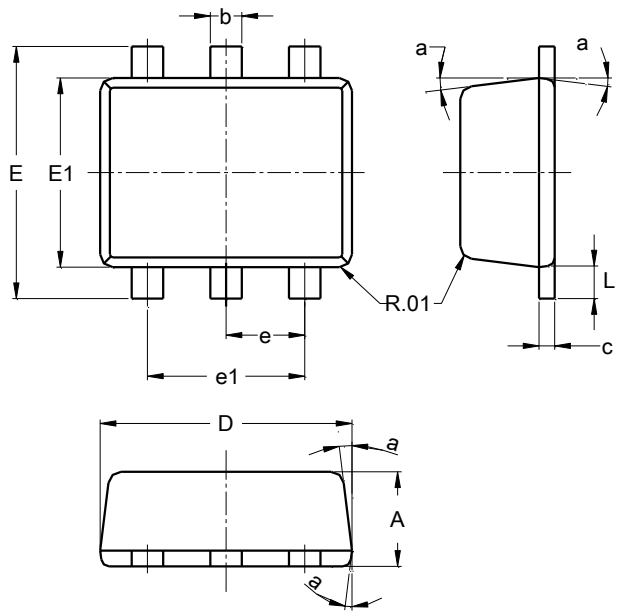

Figure 13. Transient Thermal Resistance


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## Package Outline Dimensions

Please see http://www.diodes.com/package-outlines.html for the latest version.

**SOT563**

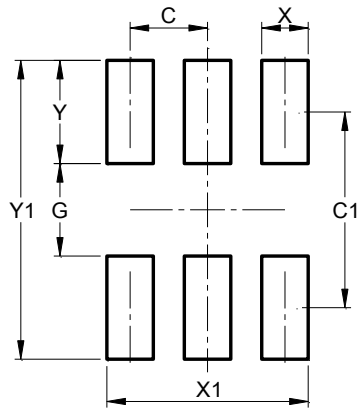



| SOT563 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 0.55 | 0.60 | -- |
| **b** | 0.15 | 0.30 | 0.20 |
| **c** | 0.10 | 0.18 | 0.11 |
| **D** | 1.50 | 1.70 | 1.60 |
| **E** | 1.55 | 1.70 | 1.60 |
| **E1** | 1.10 | 1.25 | 1.20 |
| **e** | -- | -- | 0.50 |
| **e1** | 0.90 | 1.10 | 1.00 |
| **L** | 0.10 | 0.30 | 0.20 |
| **a** | 8° | 9° | 7° |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout

Please see http://www.diodes.com/package-outlines.html for the latest version.

**SOT563**




| Dimensions | Value (in mm) |
|---|---|
| **C** | 0.500 |
| **C1** | 1.270 |
| **G** | 0.600 |
| **X** | 0.300 |
| **X1** | 1.300 |
| **Y** | 0.670 |
| **Y1** | 1.940 |


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