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Lead-free Green

# DMN2053UW

## 20V N-CHANNEL ENHANCEMENT MODE MOSFET

## Product Summary

| $BV_{DSS}$ | $R_{DS(ON)}$ Max | $I_D$ Max $T_A$ = +25°C |
|---|---|---|
| 20V | 56mΩ @ $V_{GS}$ = 4.5V | 2.9A |
| | 65mΩ @ $V_{GS}$ = 2.5V | 2.7A |
| | 93mΩ @ $V_{GS}$ = 1.8V | 2.2A |
| | 140mΩ @ $V_{GS}$ = 1.5V | 1.8A |

## Features and Benefits

- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

## Description and Applications

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

- General Purpose Interfacing Switch
- Power Management Functions
- DC-DC Converters
- Analog Switch

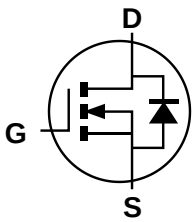
## Mechanical Data

- Case: SOT323
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections Indicator: See Diagram
- Terminals: Finish — Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.027 grams (Approximate)

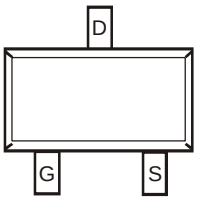
SOT323



Top View




Equivalent Circuit



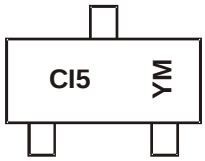

Top View

## Ordering Information (Note 4)

| Part Number | Case | Packaging |
|---|---|---|
| DMN2053UW-7 | SOT323 | 3,000/Tape & Reel |
| DMN2053UW-13 | SOT323 | 10,000/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/.

## Marking Information




CI5 = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: G = 2019)
M = Month (ex: 9 = September)

Date Code Key

| Year | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
|---|---|---|---|---|---|---|---|---|
| Code | F | G | H | I | J | K | L | M |

| 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 |


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

| Characteristic | | | Symbol | Value | Unit |
|---|---|---|---|---|---|
| Drain-Source Voltage | | | $V_{DSS}$ | 20 | V |
| Gate-Source Voltage | | | $V_{GSS}$ | ±12 | V |
| Continuous Drain Current (Note 6) $V_{GS}$ = 4.5V | Steady State | $T_A$ = +25°C<br>$T_A$ = +70°C | $I_D$ | 2.9<br>2.3 | A |
| Pulsed Drain Current (10µs Pulse, Duty Cycle=1%) | | | $I_{DM}$ | 20 | A |
| Maximum Body Diode Forward Current (Note 5) | | | $I_S$ | 1.0 | A |

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

| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Total Power Dissipation (Note 5) | | $P_D$ | 0.47 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State | $R_{\theta JA}$ | 268 | °C/W |
| Total Power Dissipation (Note 6) | | $P_D$ | 0.7 | W |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady State | $R_{\theta JA}$ | 178 | °C/W |
| Operating and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to +150 | °C |

## 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 | $V_{GS}$ = 0V, $I_D$ = 1mA |
| Zero Gate Voltage Drain Current @$T_C$ = +25°C | $I_{DSS}$ | — | — | 1 | µA | $V_{DS}$ = 20V, $V_{GS}$ = 0V |
| Gate-Source Leakage | $I_{GSS}$ | — | — | ±1 | µA | $V_{GS}$ = ±10V, $V_{DS}$ = 0V |
| **ON CHARACTERISTICS (Note 7)** | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | 0.35 | — | 1.0 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250µA |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | — | 39 | 56 | mΩ | $V_{GS}$ = 4.5V, $I_D$ = 2A |
| | | — | 45 | 65 | | $V_{GS}$ = 2.5V, $I_D$ = 2A |
| | | — | 51 | 93 | | $V_{GS}$ = 1.8V, $I_D$ = 1A |
| | | — | 75 | 140 | | $V_{GS}$ = 1.5V, $I_D$ = 0.5A |
| Diode Forward Voltage | $V_{SD}$ | — | 0.7 | 1.0 | V | $V_{GS}$ = 0V, $I_S$ = 1A |
| **DYNAMIC CHARACTERISTICS (Note 8)** | | | | | | |
| Input Capacitance | $C_{iss}$ | — | 369 | — | pF | $V_{DS}$ = 10V, $V_{GS}$ = 0V, f = 1.0MHz |
| Output Capacitance | $C_{oss}$ | — | 54 | — | pF | |
| Reverse Transfer Capacitance | $C_{rss}$ | — | 32 | — | pF | |
| Gate Resistance | $R_g$ | — | 4.1 | — | Ω | $V_{DS}$ = 0V, $V_{GS}$ = 0V, f = 1MHz |
| Total Gate Charge | $Q_g$ | — | 3.6 | — | nC | $V_{GS}$ = 4.5V, $V_{DS}$ = 10V, $I_D$ = 6A |
| Gate-Source Charge | $Q_{gs}$ | — | 0.4 | — | nC | |
| Gate-Drain Charge | $Q_{gd}$ | — | 1.0 | — | nC | |
| Turn-On Delay Time | $t_{D(ON)}$ | — | 2.6 | — | ns | $V_{DD}$ = 10V, $V_{GS}$ = 5V, $R_G$ = 6Ω, $I_D$ = 6A |
| Turn-On Rise Time | $t_R$ | — | 3.0 | — | ns | |
| Turn-Off Delay Time | $t_{D(OFF)}$ | — | 12.5 | — | ns | |
| Turn-Off Fall Time | $t_F$ | — | 3.6 | — | ns | |
| Reverse Recovery Time | $t_{RR}$ | — | 6.0 | — | ns | $I_F$ = 1.0A, di/dt = 100A/µs |
| Reverse Recovery Charge | $Q_{RR}$ | — | 0.9 | — | nC | $I_F$ = 1.0A, di/dt = 100A/µs |

Notes:
5. Device mounted on FR-4 substrate PC board, with minimum recommended pad layout.
6. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate.
7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to product testing.


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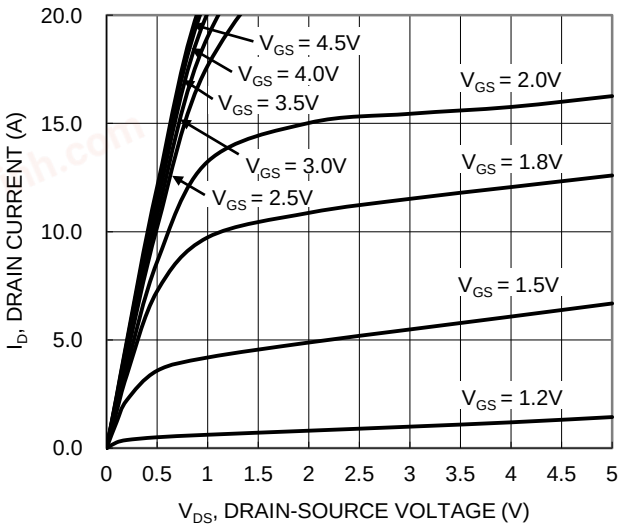



Figure 1. Typical Output Characteristic

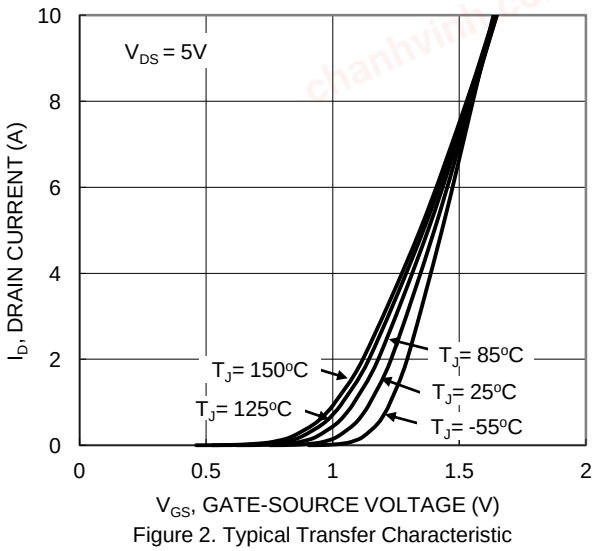



Figure 2. Typical Transfer Characteristic

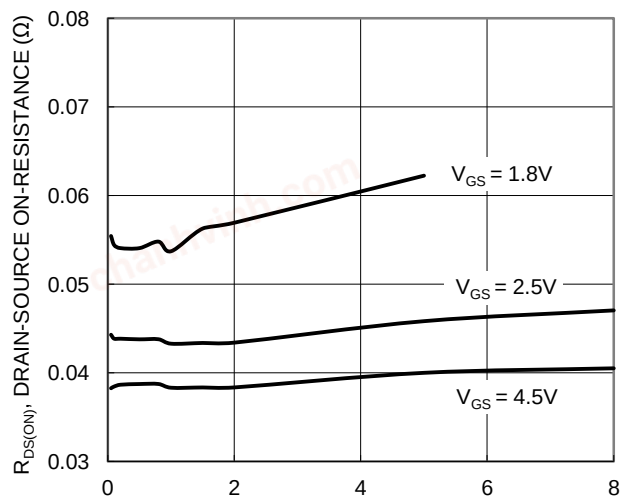



Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

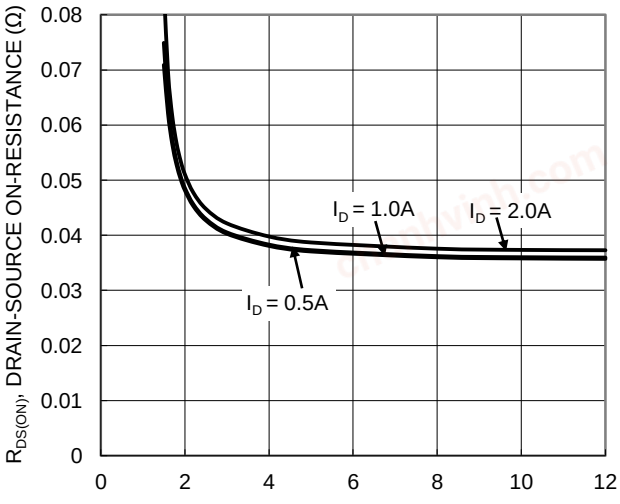



Figure 4. Typical Transfer Characteristic

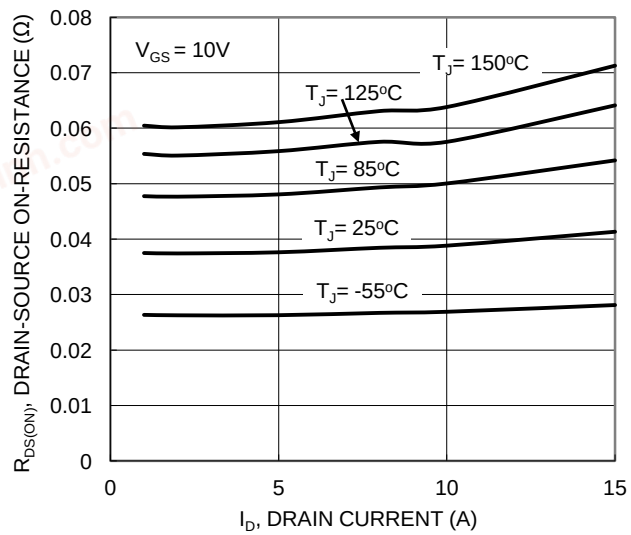



Figure 5. Typical On-Resistance vs. Drain Current and Temperature

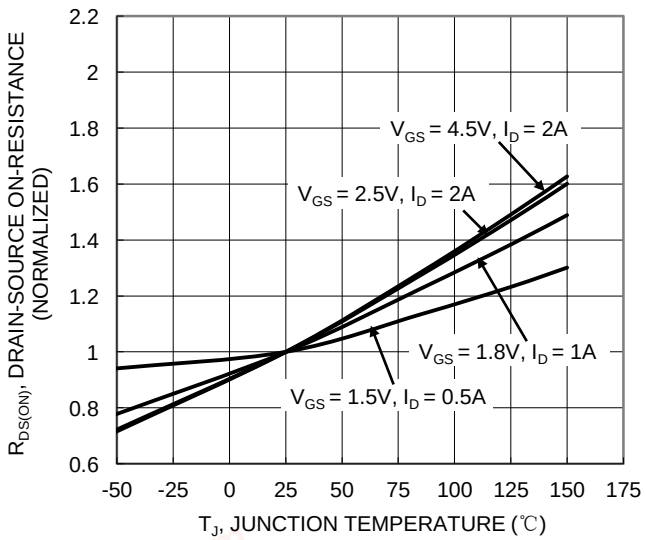



Figure 6. On-Resistance Variation with Temperature


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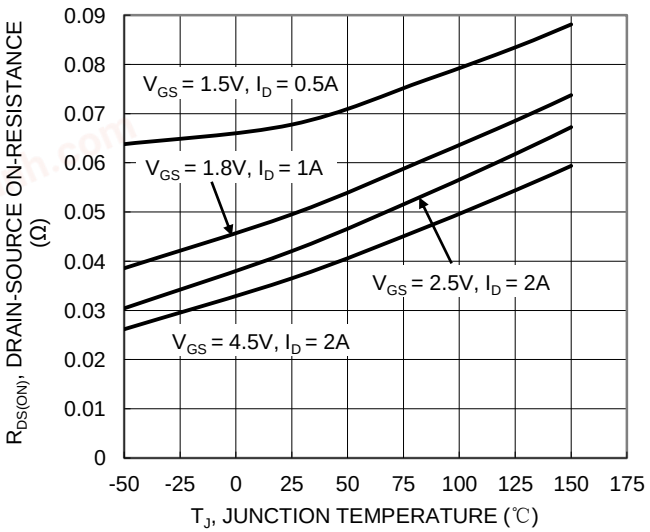



Figure 7. On-Resistance Variation with Temperature

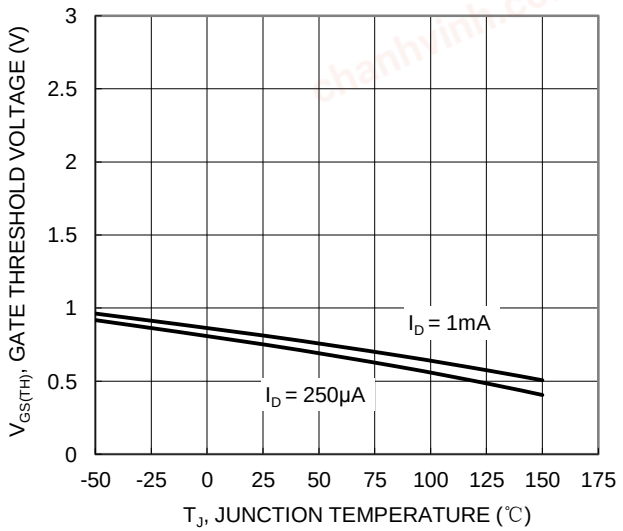



Figure 8. Gate Threshold Variation vs. Junction Temperature

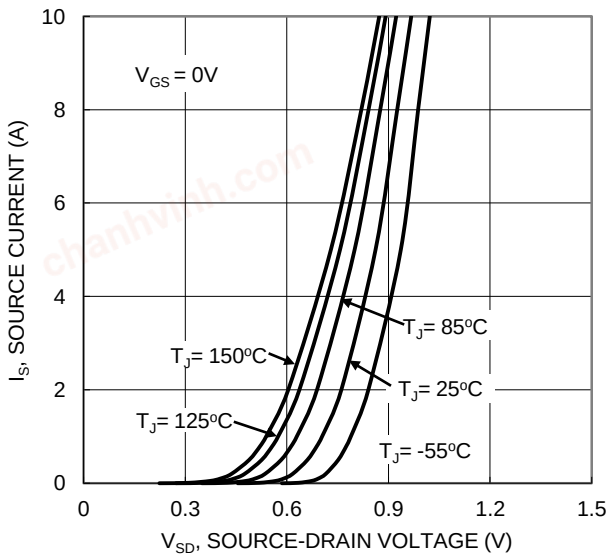



Figure 9. Diode Forward Voltage vs. Current

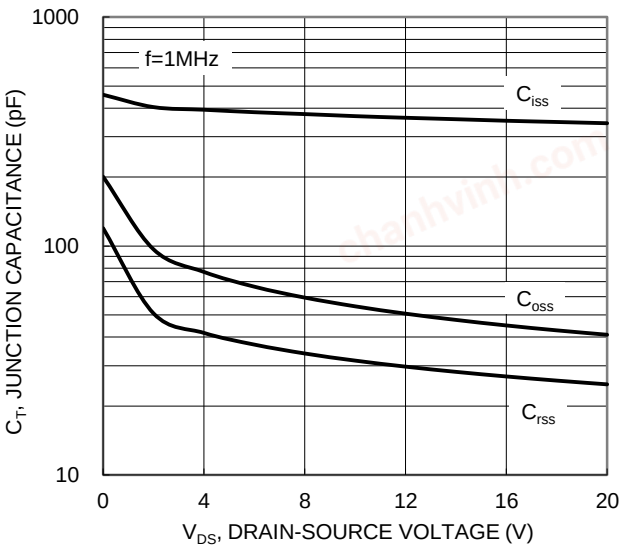



Figure 10. Typical Junction Capacitance

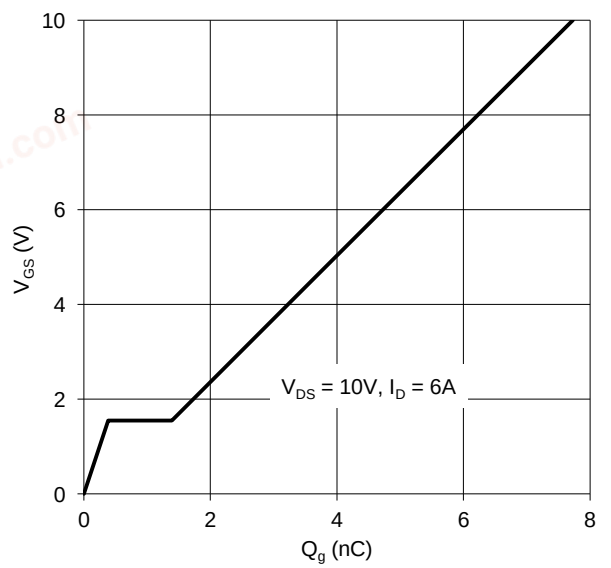



Figure 11. Gate Charge

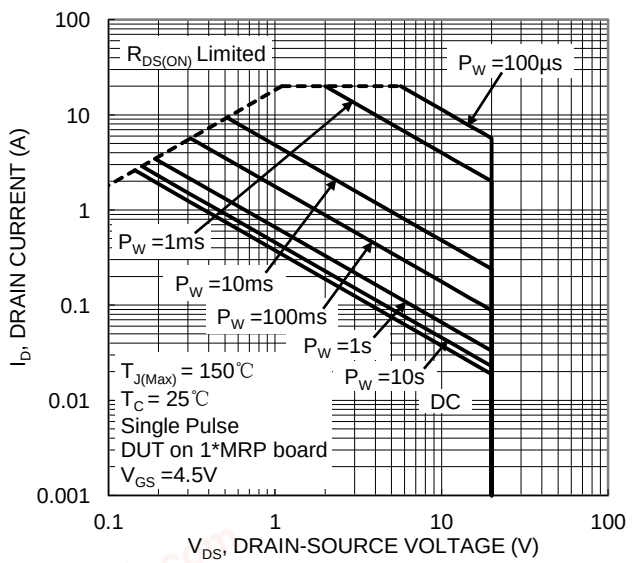



Figure 12. SOA, Safe Operation Area


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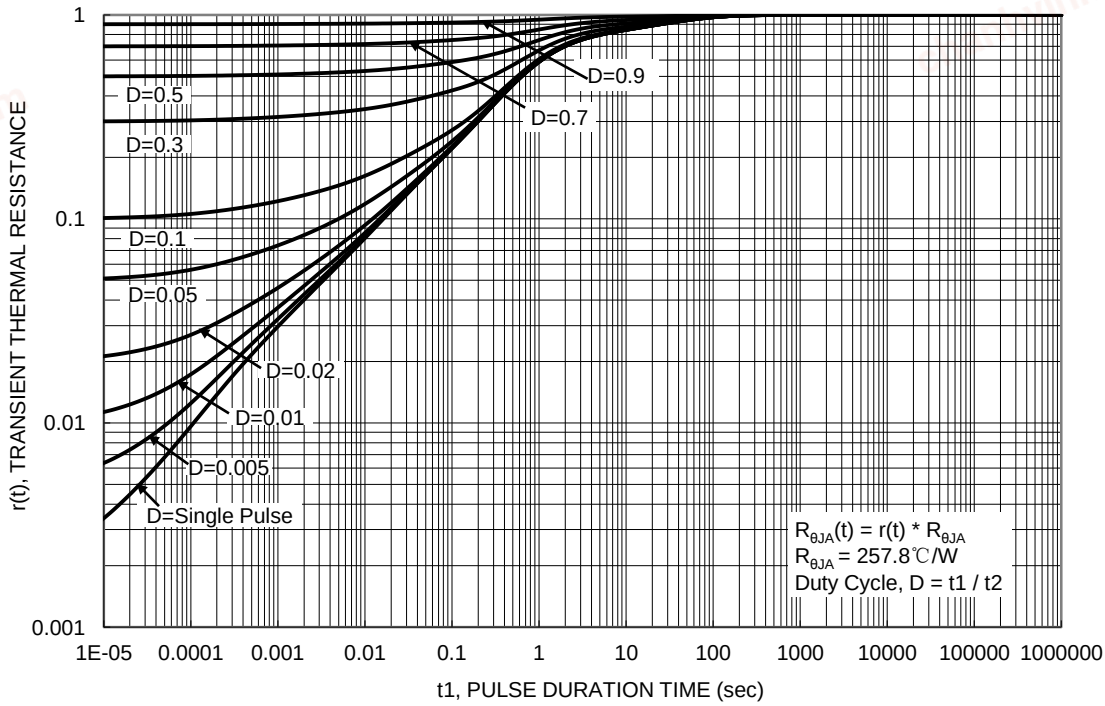



Figure 13. Transient Thermal Resistance


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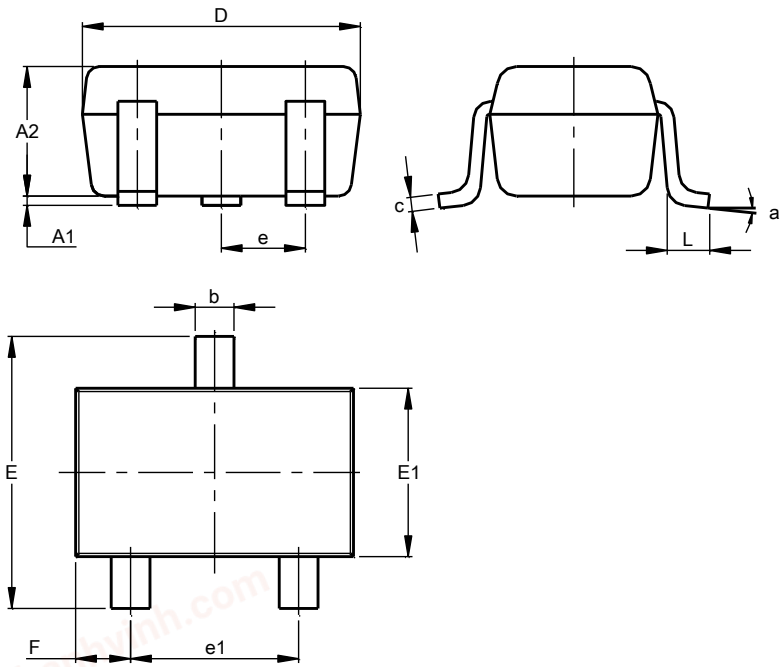
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## Package Outline Dimensions

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

**SOT323**

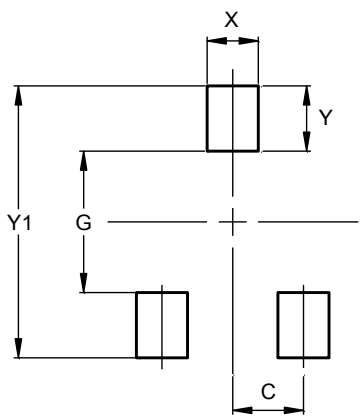



| SOT323 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A1** | 0.00 | 0.10 | 0.05 |
| **A2** | 0.90 | 1.00 | 0.95 |
| **b** | 0.25 | 0.40 | 0.30 |
| **c** | 0.10 | 0.18 | 0.11 |
| **D** | 1.80 | 2.20 | 2.15 |
| **E** | 2.00 | 2.20 | 2.10 |
| **E1** | 1.15 | 1.35 | 1.30 |
| **e** | 0.650 BSC | | |
| **e1** | 1.20 | 1.40 | 1.30 |
| **F** | 0.375 | 0.475 | 0.425 |
| **L** | 0.25 | 0.40 | 0.30 |
| **a** | 0° | 8° | -- |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout

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

**SOT323**




| Dimensions | Value (in mm) |
|---|---|
| **C** | 0.650 |
| **G** | 1.300 |
| **X** | 0.470 |
| **Y** | 0.600 |
| **Y1** | 2.500 |


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