

## Product Summary

| $BV_{DSS}$ | $R_{DS(ON)} \text{ Max}$              | $I_D \text{ Max}$<br>$T_A = +25^\circ\text{C}$ |
|------------|---------------------------------------|--|
| 20V        | 42m $\Omega$ @ $V_{GS} = 10\text{V}$  | 3.5A   |
|            | 45m $\Omega$ @ $V_{GS} = 4.5\text{V}$ | 3.3A   |

## Description

This MOSFET is 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.

## Applications

- Motor Control
- Power Management Functions
- Backlighting

## Features and Benefits

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

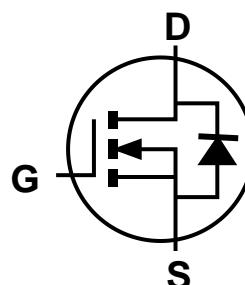
## Mechanical Data

- Case: SOT323
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish — Matte Tin Annealed over Alloy 42 Leadframe. Solderable per MIL-STD-202, Method 208 (e3)
- Weight: 0.006 grams (Approximate)

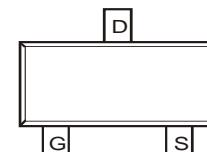
SOT323



Top View



Equivalent Circuit



Top View

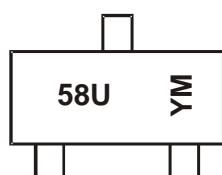
## Ordering Information (Note 4)

| Part Number  | Case   | Packaging         |
|--------------|--------|-------------------|
| DMN2058UW-7  | SOT323 | 3000/Tape & Reel  |
| DMN2058UW-13 | SOT323 | 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/>.

## Marking Information



58U = Product Type Marking Code  
 YM or YM = Date Code Marking for SAT  
 Y or Y = Year (ex: F = 2018)  
 M = Month (ex: 9 = September)

Date Code Key

| Year | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
|------|------|------|------|------|------|------|------|------|------|
| Code | E    | 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   | 0   | N   | D   |

**Maximum Ratings** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

| Characteristic  |              |                           | Symbol    | Value    | Unit |
|---|--------------|---------------------------|-----------|----------|------|
| Drain-Source Voltage  |              |                           | $V_{DSS}$ | 20       | V    |
| Gate-Source Voltage   |              |                           | $V_{GSS}$ | $\pm 12$ | V    |
| Continuous Drain Current (Note 6) $V_{GS} = 10\text{V}$                 | Steady State | $T_A = +25^\circ\text{C}$ | $I_D$     | 3.5      | A    |
|   |              | $T_A = +70^\circ\text{C}$ |           | 3.0      |      |
| Maximum Continuous Body Diode Forward Current (Note 6)                  |              |                           | $I_S$     | 1.0      | A    |
| Pulsed Drain Current (10 $\mu\text{s}$ Pulse, Duty Cycle = 1%) (Note 6) |              |                           | $I_{DM}$  | 20       | A    |

**Thermal Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

| Characteristic                                   |  |  | Symbol          | Value       | Unit                      |
|--|--|--|-----------------|-------------|---------------------------|
| Total Power Dissipation (Note 5)                 |  |  | $P_D$           | 0.5         | mW                        |
| Thermal Resistance, Junction to Ambient (Note 5) |  |  | $R_{\theta JA}$ | 259         | $^\circ\text{C}/\text{W}$ |
| Total Power Dissipation (Note 6)                 |  |  | $P_D$           | 0.7         | mW                        |
| Thermal Resistance, Junction to Ambient (Note 6) |  |  | $R_{\theta JA}$ | 175         | $^\circ\text{C}/\text{W}$ |
| Operating and Storage Temperature Range          |  |  | $T_J, T_{STG}$  | -55 to +150 | $^\circ\text{C}$          |

**Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

| Characteristic                               | Symbol       | Min | Typ  | Max       | Unit             | Test Condition  |
|--|--------------|-----|------|-----------|------------------|---|
| <b>OFF CHARACTERISTICS (Note 7)</b>          |              |     |      |           |                  |   |
| Drain-Source Breakdown Voltage               | $BV_{DSS}$   | 20  | —    | —         | V                | $V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$                                    |
| Zero Gate Voltage Drain Current              | $I_{DSS}$    | —   | —    | 1         | $\mu\text{A}$    | $V_{DS} = 20\text{V}, V_{GS} = 0\text{V}$                                     |
| Gate-Source Leakage                          | $I_{GSS}$    | —   | —    | $\pm 100$ | nA               | $V_{GS} = \pm 12\text{V}, V_{DS} = 0\text{V}$                                 |
| <b>ON CHARACTERISTICS (Note 7)</b>           |              |     |      |           |                  |   |
| Gate Threshold Voltage                       | $V_{GS(TH)}$ | 0.4 | —    | 1.2       | V                | $V_{DS} = V_{GS}, I_D = 250\mu\text{A}$                                       |
| Static Drain-Source On-Resistance            | $R_{DS(ON)}$ | —   | 31.5 | 42        | $\text{m}\Omega$ | $V_{GS} = 10\text{V}, I_D = 3\text{A}$  |
|  |              |     | 32   | 45        |                  | $V_{GS} = 4.5\text{V}, I_D = 2\text{A}$                                       |
|  |              |     | 40.5 | 60        |                  | $V_{GS} = 2.5\text{V}, I_D = 2\text{A}$                                       |
|  |              |     | 48   | 91        |                  | $V_{GS} = 1.8\text{V}, I_D = 1\text{A}$                                       |
| Diode Forward Voltage                        | $V_{SD}$     | —   | 0.78 | 1.2       | V                | $V_{GS} = 0\text{V}, I_S = 1\text{A}$   |
| <b>DYNAMIC CHARACTERISTICS (Note 8)</b>      |              |     |      |           |                  |   |
| Input Capacitance                            | $C_{iss}$    | —   | 281  | —         | $\text{pF}$      | $V_{DS} = 10\text{V}, V_{GS} = 0\text{V}$<br>$f = 1.0\text{MHz}$              |
| Output Capacitance                           | $C_{oss}$    | —   | 50   | —         | $\text{pF}$      |   |
| Reverse Transfer Capacitance                 | $C_{rss}$    | —   | 39   | —         | $\text{pF}$      |   |
| Gate Resistance                              | $R_g$        | —   | 3.1  | —         | $\Omega$         | $f = 1.0\text{MHz}, V_{GS} = 0\text{V}, V_{DS} = 0\text{V}$                   |
| Total Gate Charge ( $V_{GS} = 4.5\text{V}$ ) | $Q_g$        | —   | 3.6  | —         | $\text{nC}$      | $V_{DS} = 10\text{V}, I_D = 6.0\text{A}$                                      |
| Total Gate Charge ( $V_{GS} = 10\text{V}$ )  | $Q_g$        | —   | 7.7  | —         | $\text{nC}$      |   |
| Gate-Source Charge                           | $Q_{gs}$     | —   | 0.5  | —         | $\text{nC}$      |   |
| Gate-Drain Charge                            | $Q_{gd}$     | —   | 0.9  | —         | $\text{nC}$      |   |
| Turn-On Delay Time                           | $t_{D(ON)}$  | —   | 2.0  | —         | ns               | $V_{GS} = 4.5\text{V}, V_{DD} = 10\text{V}, R_g = 6\Omega, I_D = 6.0\text{A}$ |
| Turn-On Rise Time                            | $t_R$        | —   | 4.9  | —         | ns               |   |
| Turn-Off Delay Time                          | $t_{D(OFF)}$ | —   | 9.9  | —         | ns               |   |
| Turn-Off Fall Time                           | $t_F$        | —   | 3.3  | —         | ns               |   |
| Body Diode Reverse Recovery Time             | $t_{RR}$     | —   | 5.4  | —         | ns               | $I_F = 6.0\text{A}, di/dt = 100\text{A}/\mu\text{s}$                          |
| Body Diode Reverse Recovery Charge           | $Q_{RR}$     | —   | 0.7  | —         | $\text{nC}$      | $I_F = 6.0\text{A}, di/dt = 100\text{A}/\mu\text{s}$                          |

Notes:

5. Device mounted on FR-4 PCB, with minimum recommended pad layout.
6. Device mounted on 1" x 1" FR-4 PCB with high coverage 2oz. Copper, single sided.
7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to product testing.

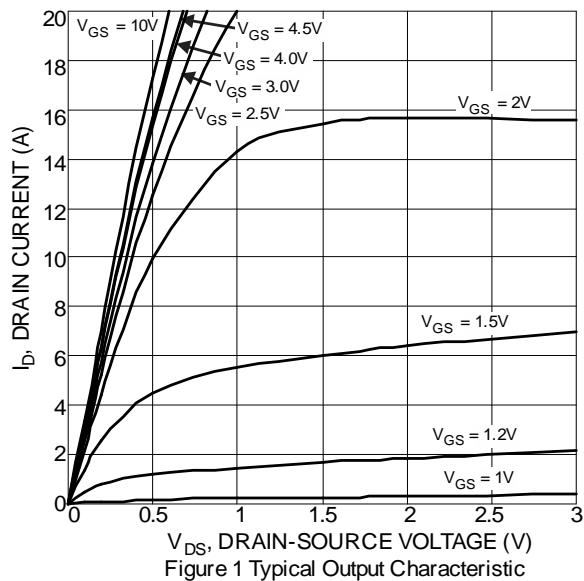


Figure 1 Typical Output Characteristic

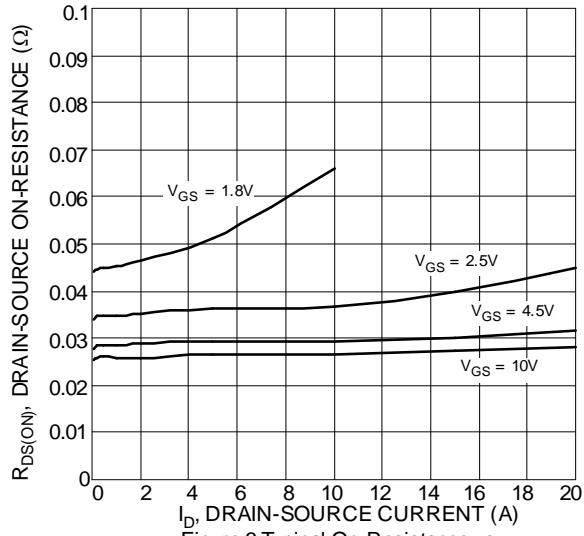


Figure 3 Typical On-Resistance vs.  
Drain Current and Gate Voltage

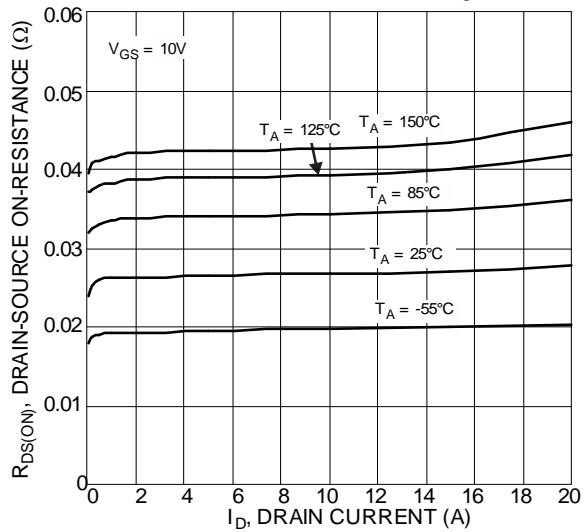


Figure 5 Typical On-Resistance vs.  
Drain Current and Temperature

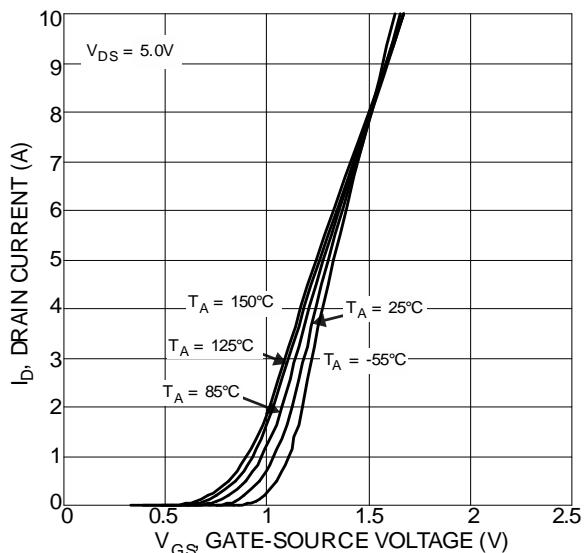


Figure 2 Typical Transfer Characteristics

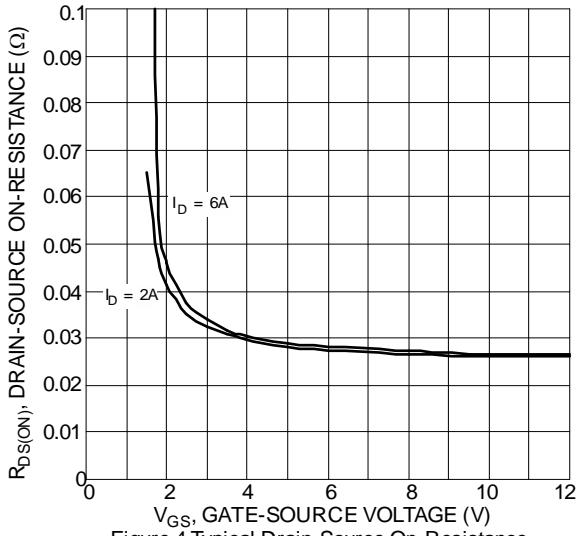


Figure 4 Typical Drain-Source On-Resistance  
vs. Gate-Source Voltage

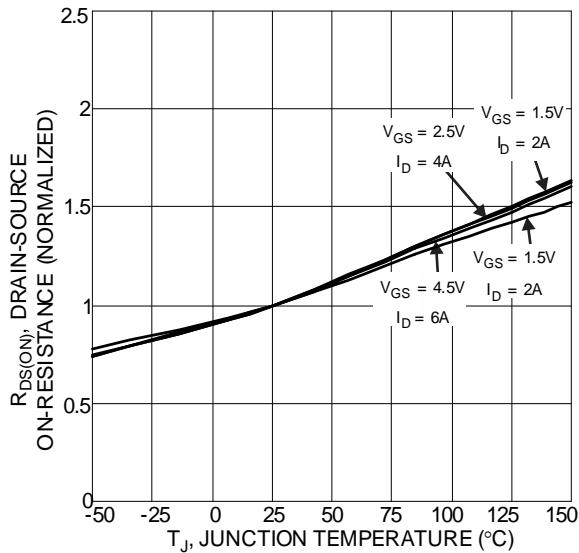


Figure 6 On-Resistance Variation with Temperature

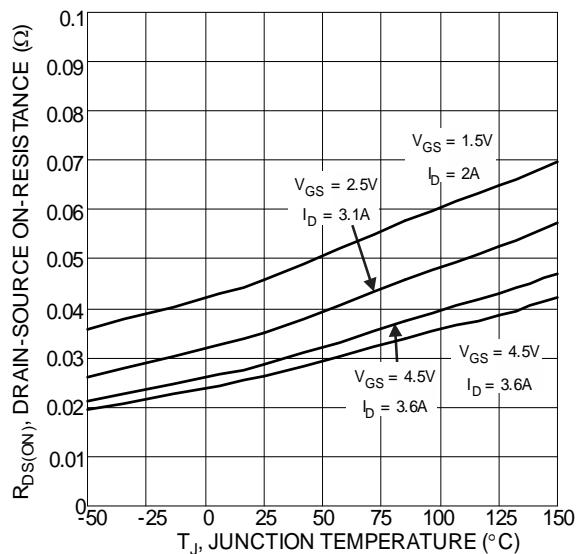


Figure 7 On-Resistance Variation with Temperature

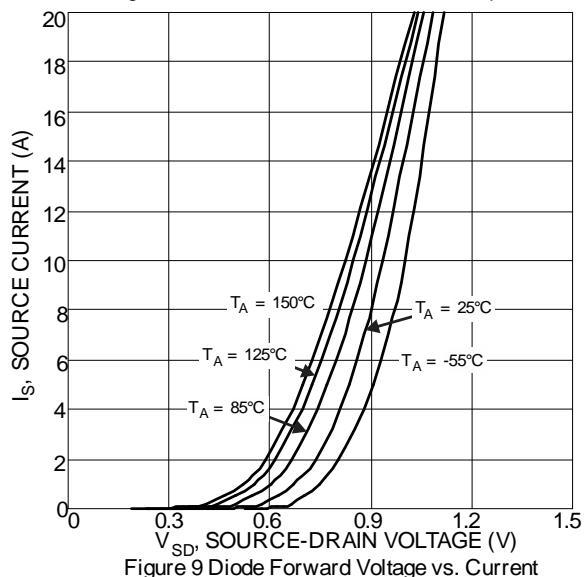


Figure 9 Diode Forward Voltage vs. Current

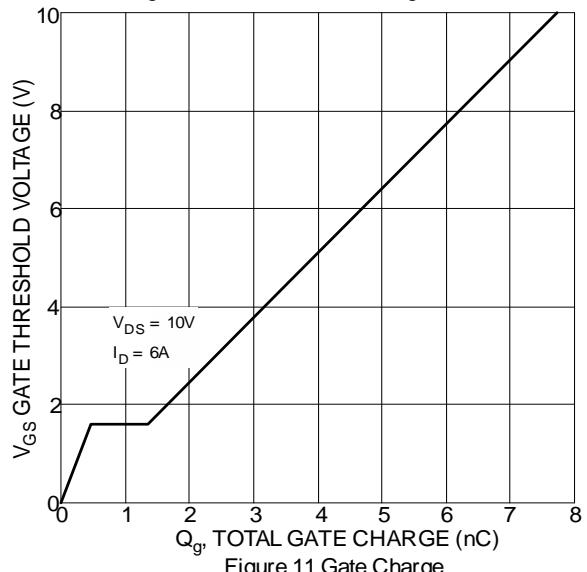


Figure 11 Gate Charge

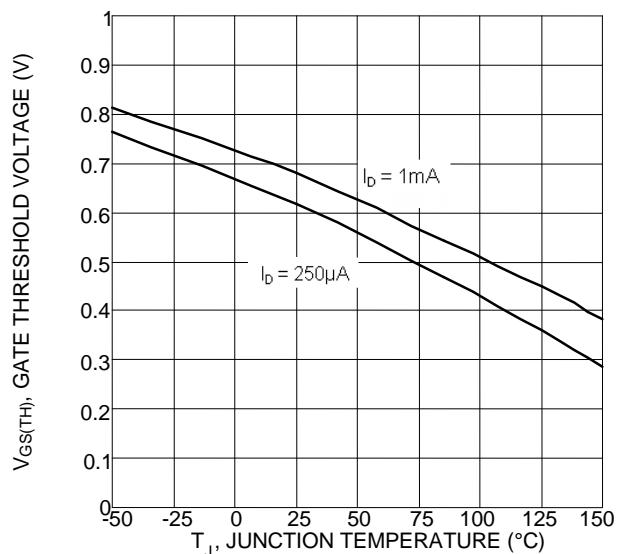
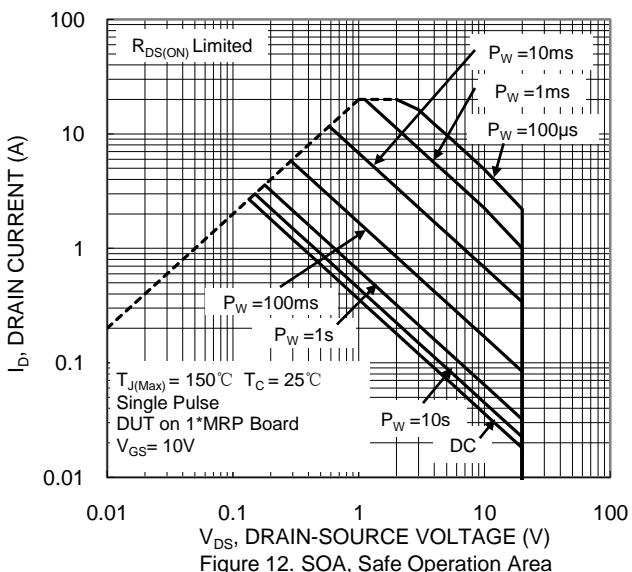
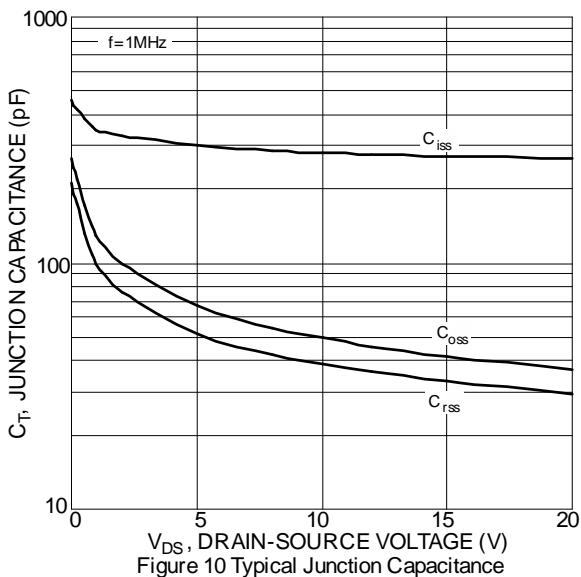


Figure 8 Gate Threshold Variation vs. Junction Temperature



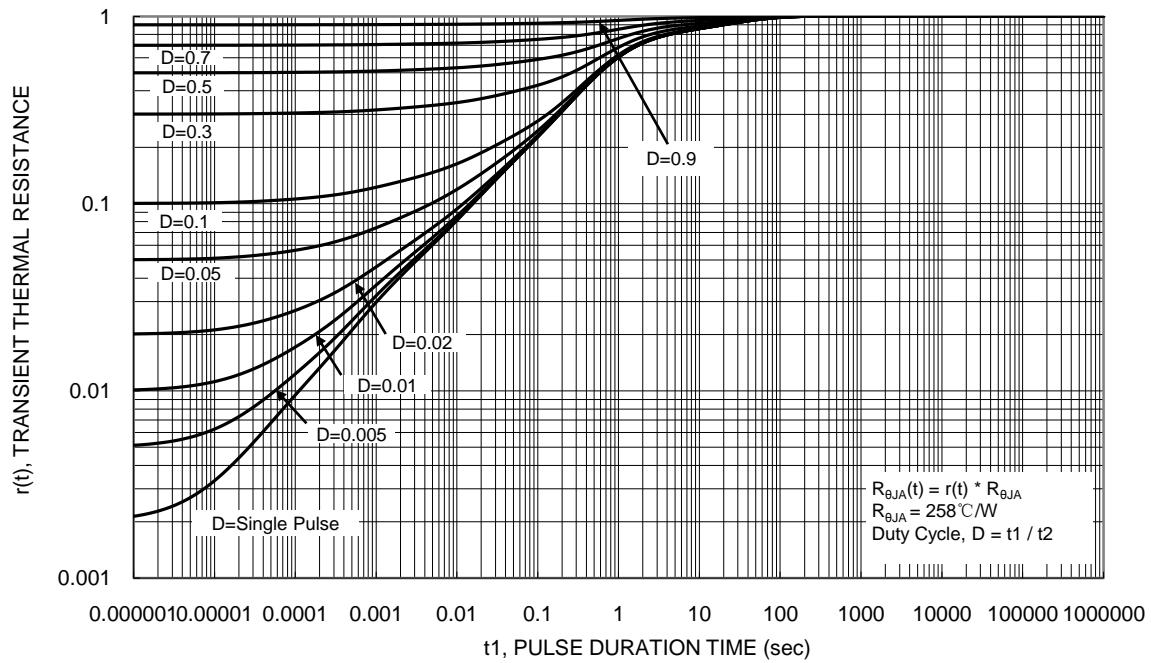
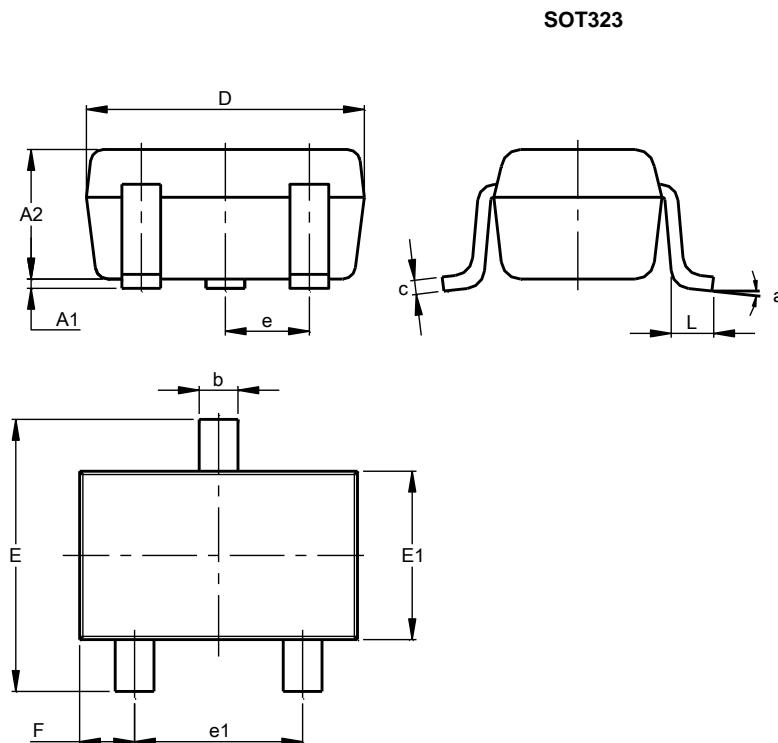


Figure 13. Transient Thermal Resistance

## Package Outline Dimensions

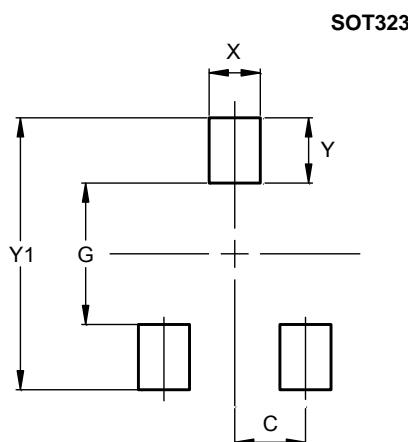
Please see <http://www.diodes.com/package-outlines.html> for the latest version.



| 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.



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

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