

## Product Summary

Device	V <sub>DSS</sub>	R <sub>DSON</sub> Max	I <sub>D</sub> Max T <sub>A</sub> = +25°C
Q1	30V	1.5Ω @ V <sub>GS</sub> = 4.5V	350mA
		2.0Ω @ V <sub>GS</sub> = 2.5V	

## Description

This MOSFET is designed to minimize the on-state resistance (R<sub>DSON</sub>), yet maintain superior switching performance, making it ideal for high efficiency power management applications.

## Applications

- Motor Control
- Power Management Functions

## Features

- Low On-Resistance: R<sub>DSON</sub>
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- **ESD Protected Gate**
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

## Mechanical Data

- Case: SOT523
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020D
- Terminals: Finish — Matte Tin Annealed over Alloy 42 Leadframe. Solderable per MIL-STD-202, Method 208③
- Terminal Connections: See Diagram
- Weight: 0.002 grams (Approximate)

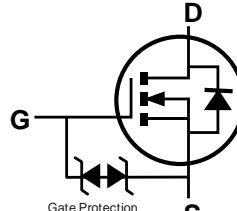
SOT523



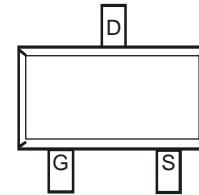
ESD PROTECTED



Top View



Equivalent Circuit



Top View  
Pin Out Configuration

## Ordering Information (Note 4)

Part Number	Case	Packaging
DMN31D6UT-7	SOT523	3,000/Tape & Reel
DMN31D6UT-13	SOT523	10,000/Tape & Reel

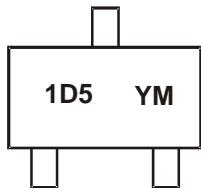
Notes:

1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) 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 <http://www.diodes.com/products/packages.html>.

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## Marking Information

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1D5 = Product Type Marking Code

YM = Date Code Marking

Y = Year (ex: B = 2014)

M = Month (ex: 9 = September)

**Date Code Key**

Year	2014	2015	2016	2017	2018	2019	2020	2021				
Code	B	C	D	E	F	G	H	I				
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 (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

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Characteristic	Symbol	Value	Units
Drain-Source Voltage	$V_{DSS}$	30	V
Gate-Source Voltage	$V_{GSS}$	$\pm 12$	V
Drain Current (Note 6)	$I_D$	350	mA
Pulsed Drain Current (Note 6)	$I_{DM}$	800	mA

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## Thermal Characteristics

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Characteristic	Symbol	Value	Units
Total Power Dissipation (Note 5)	$P_D$	210	mW
Thermal Resistance, Junction to Ambient (Note 5)	$R_{\theta JA}$	593	°C/W
		542	
Total Power Dissipation (Note 6)	$P_D$	320	mW
Thermal Resistance, Junction to Ambient (Note 6)	$R_{\theta JA}$	398	°C/W
		363	
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	°C

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.

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b> (Note 7)						
Drain-Source Breakdown Voltage	$\text{BV}_{\text{DSS}}$	30	—	—	V	$\text{V}_{\text{GS}} = 0\text{V}$ , $\text{I}_D = 250\mu\text{A}$
Zero Gate Voltage Drain Current @ $T_C = +25^\circ\text{C}$	$\text{I}_{\text{DSS}}$	—	—	100	nA	$\text{V}_{\text{DS}} = 24\text{V}$ , $\text{V}_{\text{GS}} = 0\text{V}$
Gate-Source Leakage	$\text{I}_{\text{GSS}}$	—	—	$\pm 10$	$\mu\text{A}$	$\text{V}_{\text{GS}} = \pm 10\text{V}$ , $\text{V}_{\text{DS}} = 0\text{V}$
<b>ON CHARACTERISTICS</b> (Note 7)						
Gate Threshold Voltage	$\text{V}_{\text{GS(TH)}}$	0.4	—	1.4	V	$\text{V}_{\text{DS}} = \text{V}_{\text{GS}}$ , $\text{I}_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$\text{R}_{\text{DS(ON)}}$	—	1.1	1.5	$\Omega$	$\text{V}_{\text{GS}} = 4.5\text{V}$ , $\text{I}_D = 100\text{mA}$
		—	1.6	2.0		$\text{V}_{\text{GS}} = 2.5\text{V}$ , $\text{I}_D = 50\text{mA}$
Diode Forward Voltage	$\text{V}_{\text{SD}}$	—	0.6	1.0	V	$\text{V}_{\text{GS}} = 0\text{V}$ , $\text{I}_S = 10\text{mA}$
<b>DYNAMIC CHARACTERISTICS</b> (Note 8)						
Input Capacitance	$\text{C}_{\text{iss}}$	—	13.6	—	pF	$\text{V}_{\text{DS}} = 15\text{V}$ , $\text{V}_{\text{GS}} = 0\text{V}$ , $f = 1.0\text{MHz}$
Output Capacitance	$\text{C}_{\text{oss}}$	—	3.1	—	pF	
Reverse Transfer Capacitance	$\text{C}_{\text{rss}}$	—	2.2	—	pF	
Total Gate Charge	$\text{Q}_g$	—	0.35	—	nC	$\text{V}_{\text{GS}} = 4.5\text{V}$ , $\text{V}_{\text{DS}} = 15\text{V}$ , $\text{I}_D = 200\text{mA}$
Gate-Source Charge	$\text{Q}_{\text{gs}}$	—	0.06	—	nC	
Gate-Drain Charge	$\text{Q}_{\text{gd}}$	—	0.19	—	nC	
Turn-On Delay Time	$\text{t}_{\text{D(ON)}}$	—	3.3	—	ns	$\text{V}_{\text{DD}} = 15\text{V}$ , $\text{V}_{\text{GS}} = 4.5\text{V}$ , $\text{R}_G = 2\Omega$ , $\text{I}_D = 200\text{mA}$
Turn-On Rise Time	$\text{t}_R$	—	2.3	—	ns	
Turn-Off Delay Time	$\text{t}_{\text{D(OFF)}}$	—	7.4	—	ns	
Turn-Off Fall Time	$\text{t}_F$	—	4.4	—	ns	

Notes: 7. Short duration pulse test used to minimize self-heating effect.

8. Guaranteed by design. Not subject to product testing.

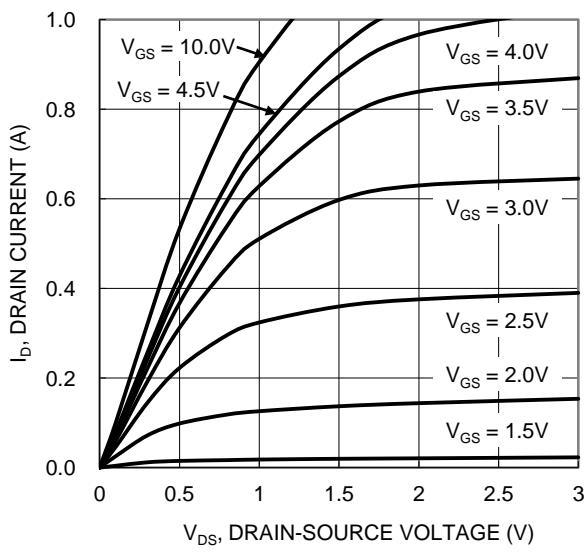


Figure 1. Typical Output Characteristic

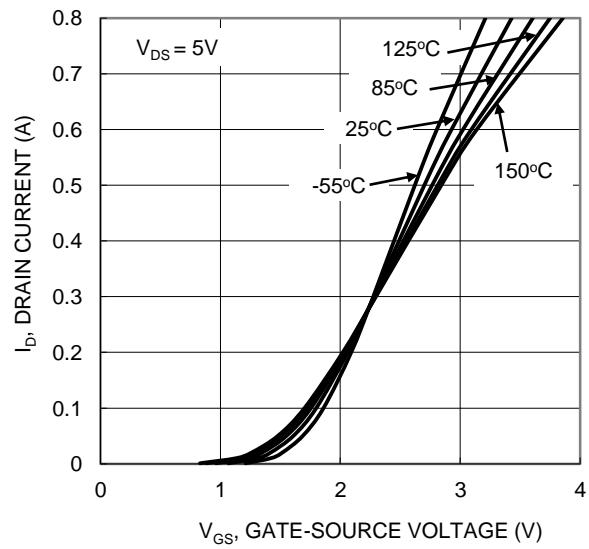


Figure 2. Typical Transfer Characteristic

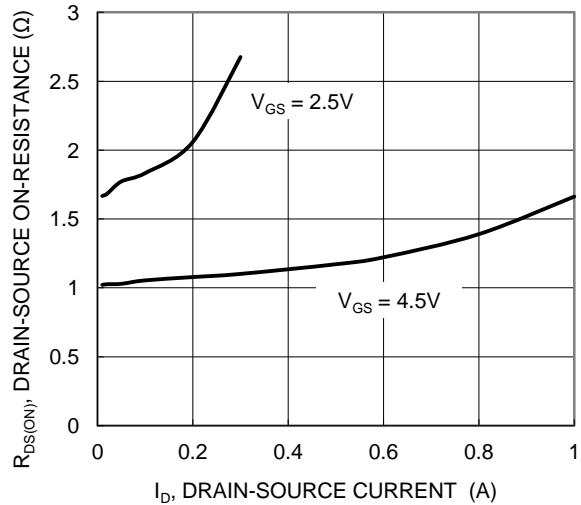


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

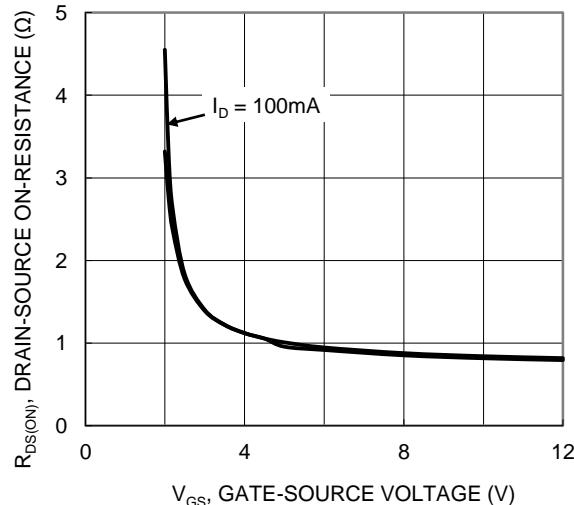


Figure 4. Typical Transfer Characteristic

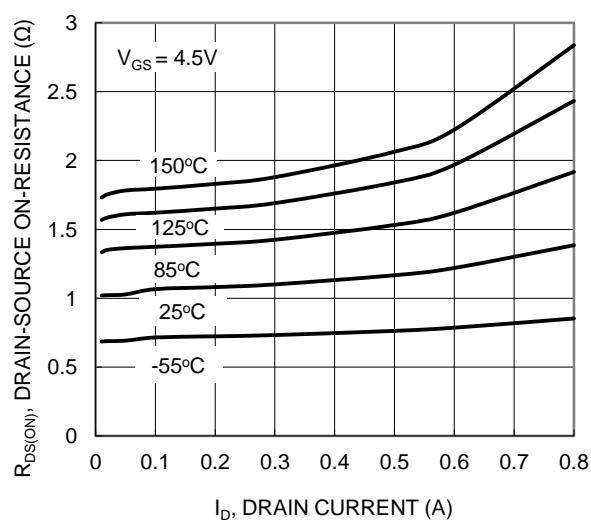


Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

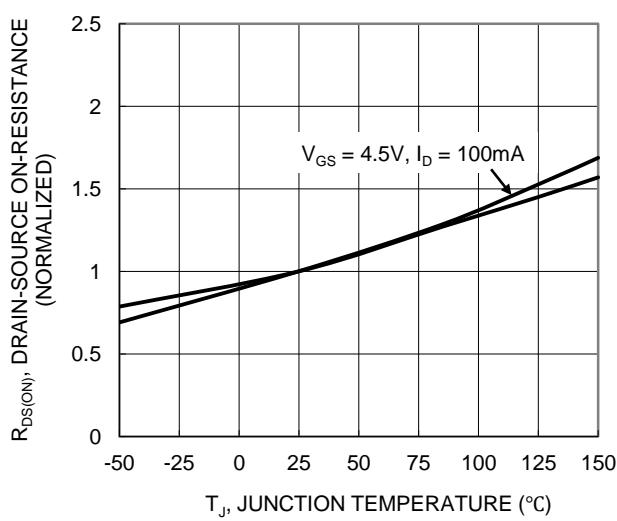
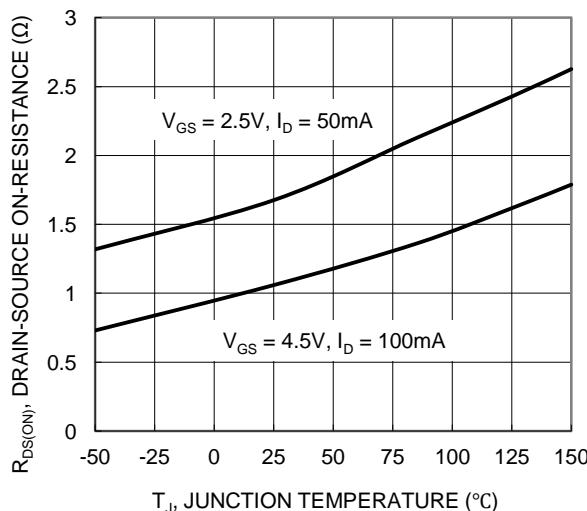
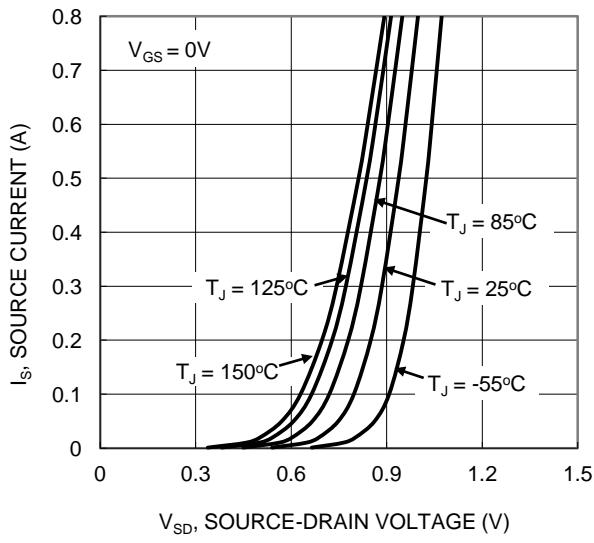


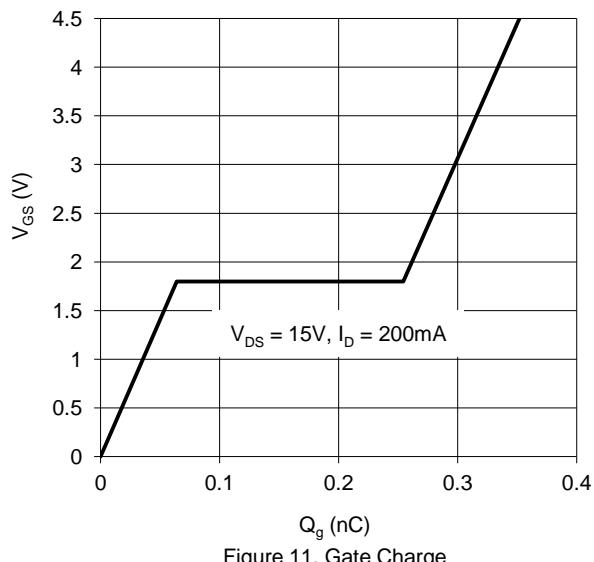
Figure 6. On-Resistance Variation with Junction Temperature



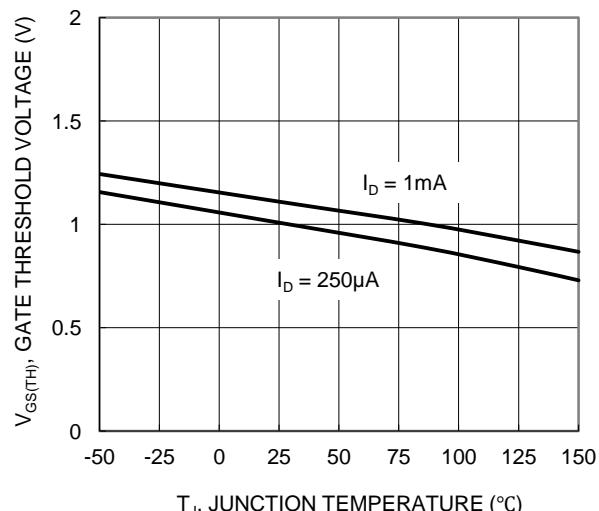
$V_{GS} = 2.5V, I_D = 50mA$   
 $V_{GS} = 4.5V, I_D = 100mA$



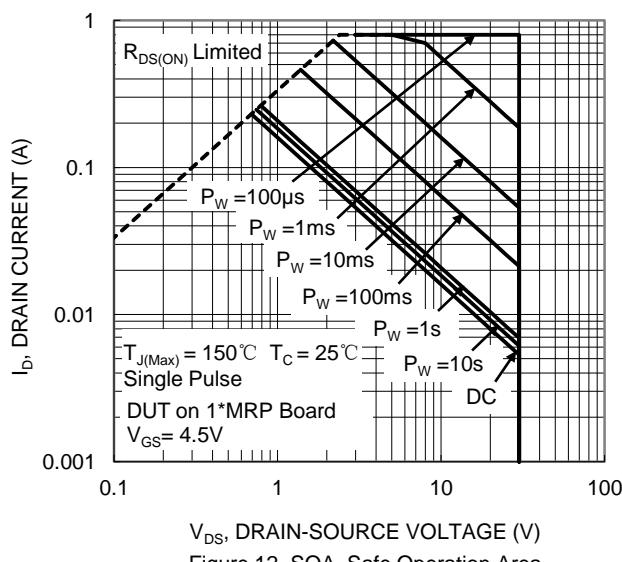
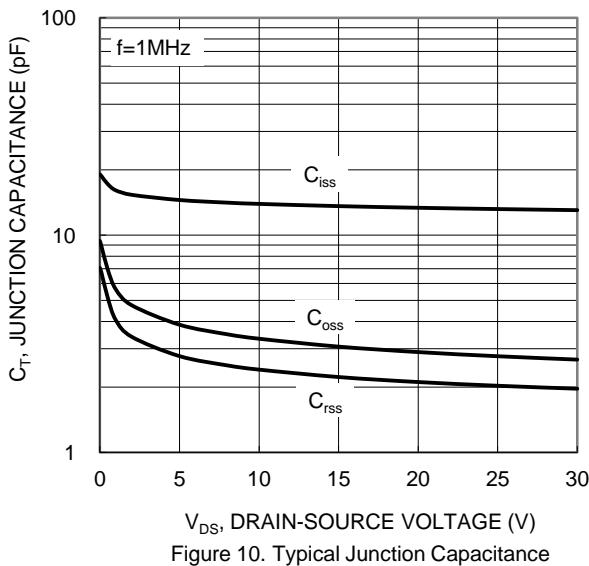
$V_{GS} = 0V$



$V_{DS} = 15V, I_D = 200mA$



$I_D = 1mA$   
 $I_D = 250\mu A$



$T_{J(\text{Max})} = 150^\circ\text{C}$   $T_C = 25^\circ\text{C}$   
Single Pulse  
DUT on 1\*MRP Board  
 $V_{GS} = 4.5V$

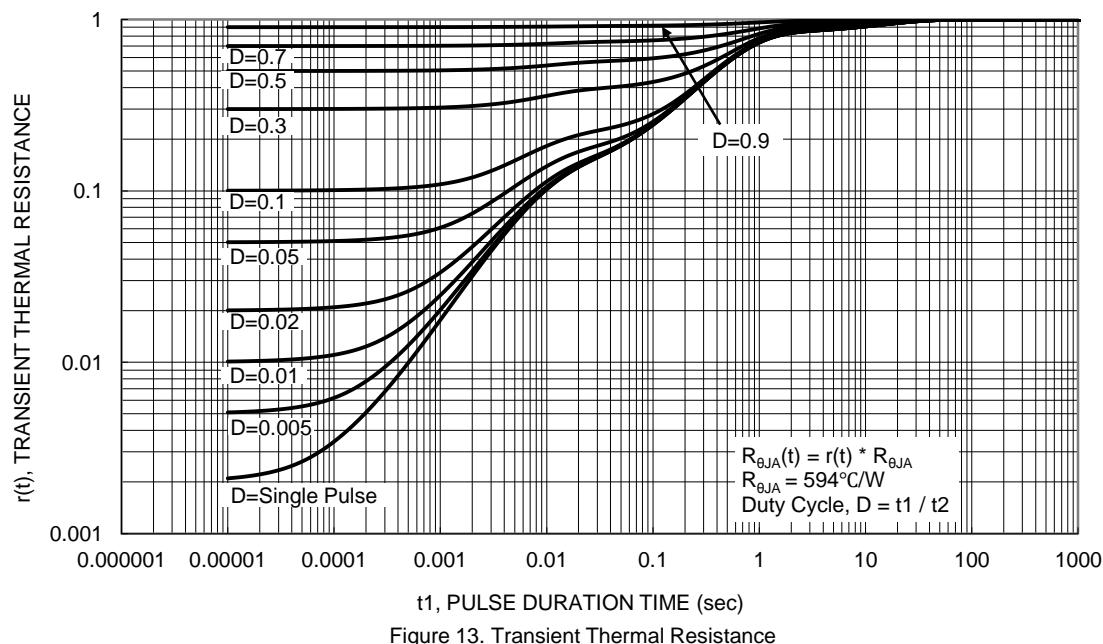
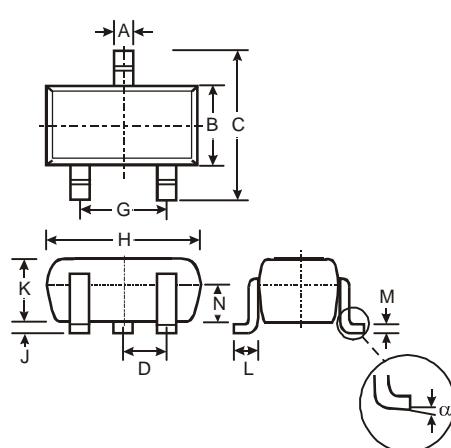


Figure 13. Transient Thermal Resistance

## Package Outline Dimensions

Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.

SOT523



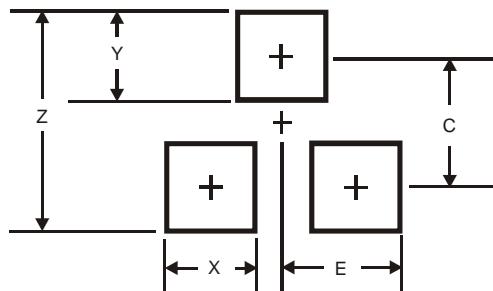
SOT523			
Dim	Min	Max	Typ
A	0.15	0.30	0.22
B	0.75	0.85	0.80
C	1.45	1.75	1.60
D	—	—	0.50
G	0.90	1.10	1.00
H	1.50	1.70	1.60
J	0.00	0.10	0.05
K	0.60	0.80	0.75
L	0.10	0.30	0.22
M	0.10	0.20	0.12
N	0.45	0.65	0.50
$\alpha$	0°	8°	—

All Dimensions in mm

## Suggested Pad Layout

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.

SOT523



Dimensions	Value (in mm)
Z	1.8
X	0.4
Y	0.51
C	1.3
E	0.7

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