

## Product Summary

BV <sub>DSS</sub>	R <sub>DS(ON)</sub> Max	I <sub>D</sub> Max
20V	35mΩ @ V <sub>GS</sub> = 10V	4.6A
	40mΩ @ V <sub>GS</sub> = 4.5V	4.3A

## Features and Benefits

- Low On-Resistance
- Low Gate Threshold Voltage
- 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)**

## Description and Applications

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

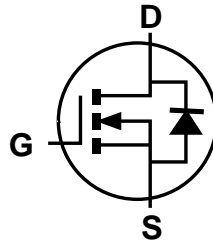
- Battery Charging
- Power Management Functions
- DC-DC Converters
- Portable Power Adaptors

## Mechanical Data

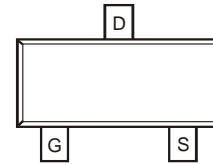
- Case: SOT23
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish—Matte Tin Annealed over Copper Lead-Frame. Solderable per MIL-STD-202, Method 208
- Terminals Connections: See Diagram Below
- Weight: 0.009 grams (Approximate)



Top View



Internal Schematic



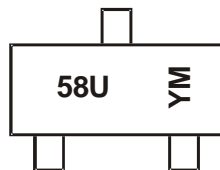
Top View

## Ordering Information (Note 4)

Part Number	Case	Packaging
DMN2058U-7	SOT23	3,000/Tape & Reel
DMN2058U-13	SOT23	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



58U = Product Type Marking Code  
 YM = Date Code Marking  
 Y or  $\bar{Y}$  = Year (ex: H = 2020)  
 M or  $\bar{M}$  = Month (ex: 9 = September)

### Date Code Key

Year	2016	~	2020	2021	2022	2023	2024	2025
Code	D	~	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

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

Characteristic			Symbol	Value	Units
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	$T_A = +25^\circ\text{C}$	$I_D$	4.6	A
		$T_A = +70^\circ\text{C}$		3.7	
Maximum Body Diode Forward Current (Note 6)			$I_S$	1.2	A
Pulsed Drain Current (10 $\mu\text{s}$ Pulse, Duty Cycle = 1%)			$I_{DM}$	24	A

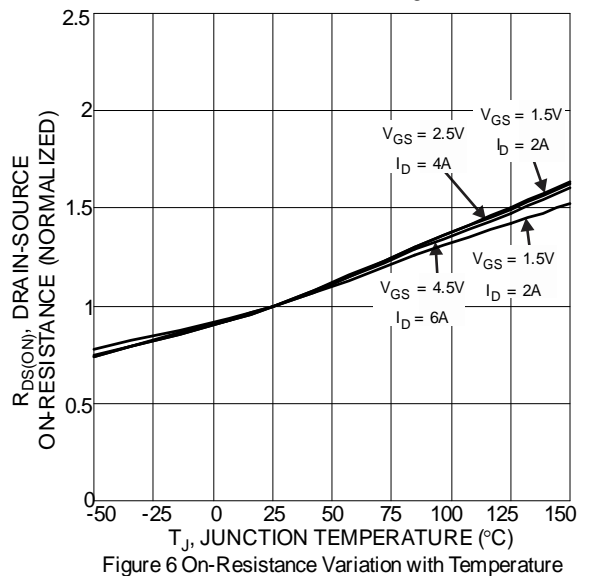
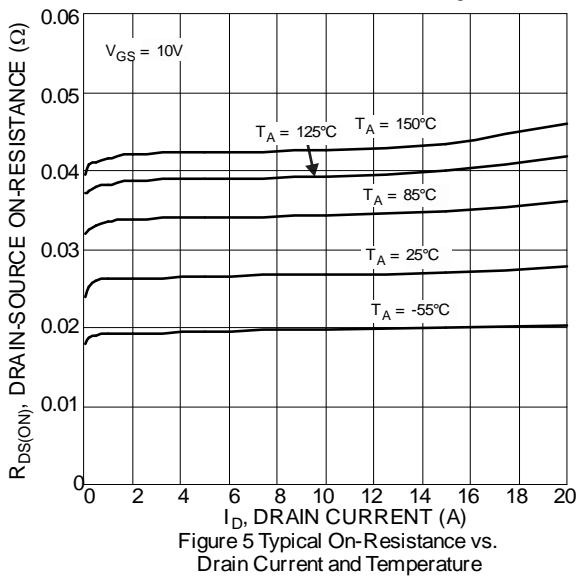
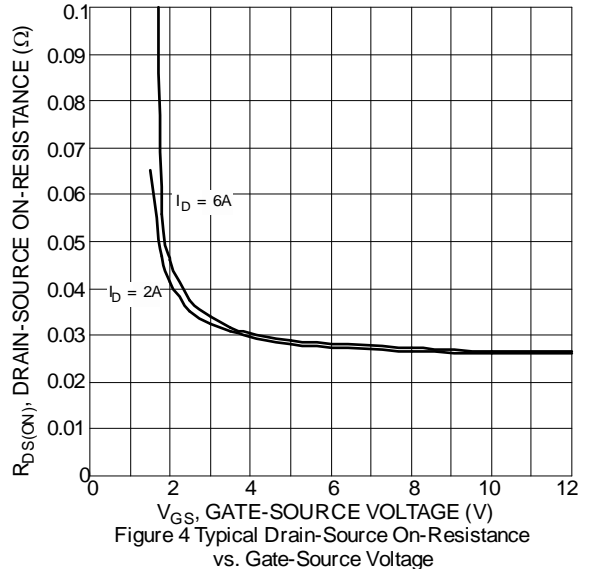
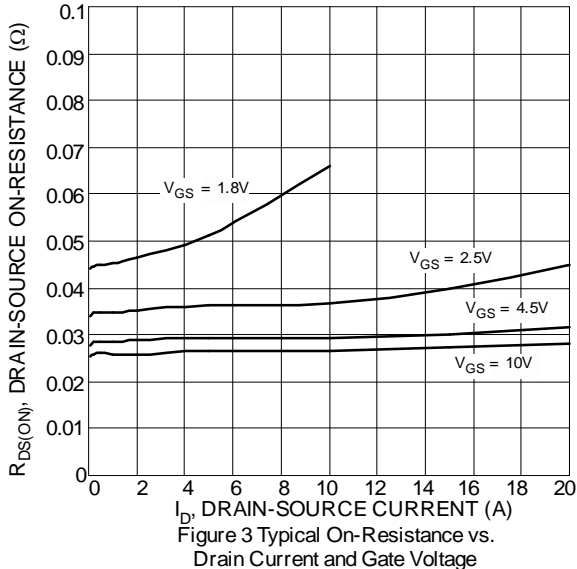
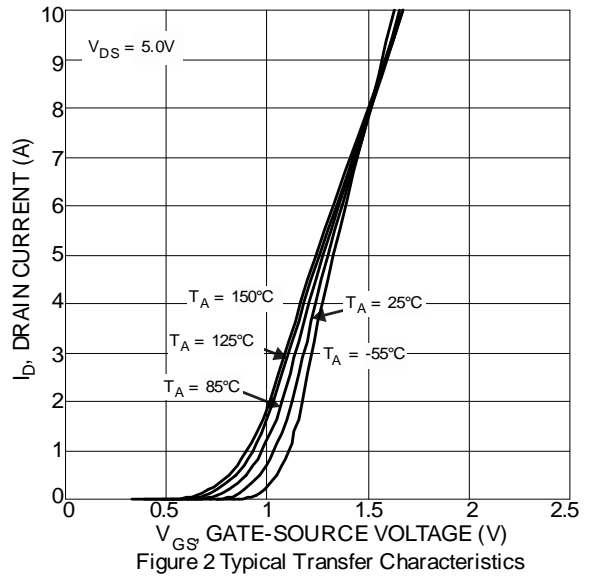
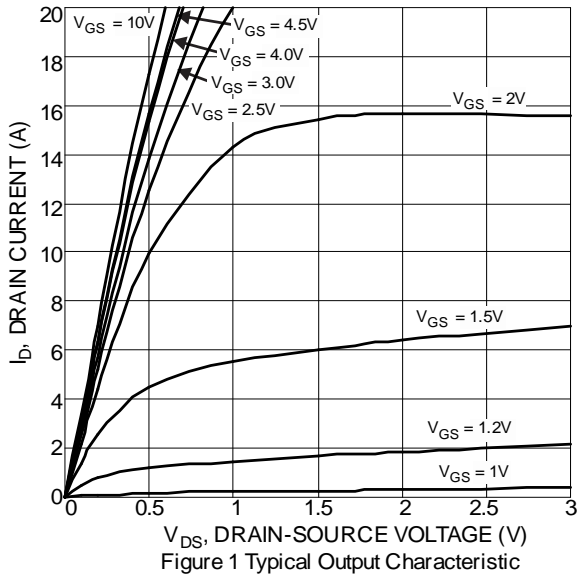
**Thermal Characteristics**

Characteristic		Symbol	Value	Unit
Power Dissipation (Note 5)		$P_D$	0.74	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	172	$^\circ\text{C/W}$
Power Dissipation (Note 6)		$P_D$	1.13	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	111	$^\circ\text{C/W}$
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</b> (Note 7)						
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</b> (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	0.4	0.6	1.2	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	27	35	m $\Omega$	$V_{GS} = 10\text{V}, I_D = 6.0\text{A}$
		—	30	40		$V_{GS} = 4.5\text{V}, I_D = 5.0\text{A}$
		—	37	60		$V_{GS} = 2.5\text{V}, I_D = 4.0\text{A}$
		—	49	91		$V_{GS} = 1.8\text{V}, I_D = 2.0\text{A}$
Diode Forward Voltage	$V_{SD}$	—	0.7	1.2	V	$V_{GS} = 0\text{V}, I_S = 1\text{A}$
<b>DYNAMIC CHARACTERISTICS</b> (Note 8)						
Input Capacitance	$C_{ISS}$	—	281	—	pF	$V_{DS} = 10\text{V}, V_{GS} = 0\text{V}$ $f = 1.0\text{MHz}$
Output Capacitance	$C_{OSS}$	—	50	—		
Reverse Transfer Capacitance	$C_{RSS}$	—	39	—		
Gate Resistance	$R_G$	—	3.1	—	$\Omega$	$V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$
Total Gate Charge ( $V_{GS} = 4.5\text{V}$ )	$Q_G$	—	3.6	—	nC	$V_{DS} = 10\text{V}, I_D = 6.0\text{A}$
Total Gate Charge ( $V_{GS} = 10\text{V}$ )	$Q_G$	—	7.7	—		
Gate-Source Charge	$Q_{GS}$	—	0.5	—		
Gate-Drain Charge	$Q_{GD}$	—	0.9	—		
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	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	9.9	—		
Turn-Off Fall Time	$t_F$	—	3.3	—		
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	—	nC	$I_F = 6.0\text{A}, di/dt = 100\text{A}/\mu\text{s}$

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



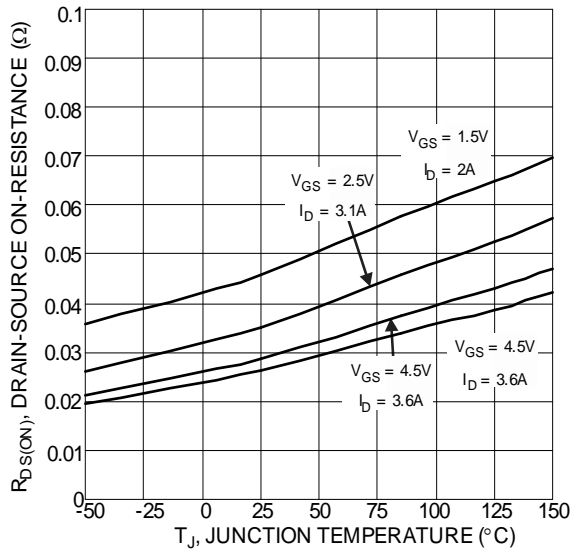


Figure 7 On-Resistance Variation with Temperature

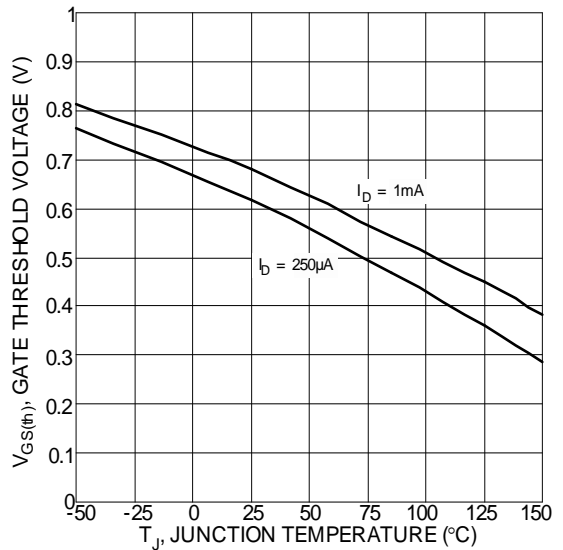


Figure 8 Gate Threshold Variation vs. Ambient Temperature

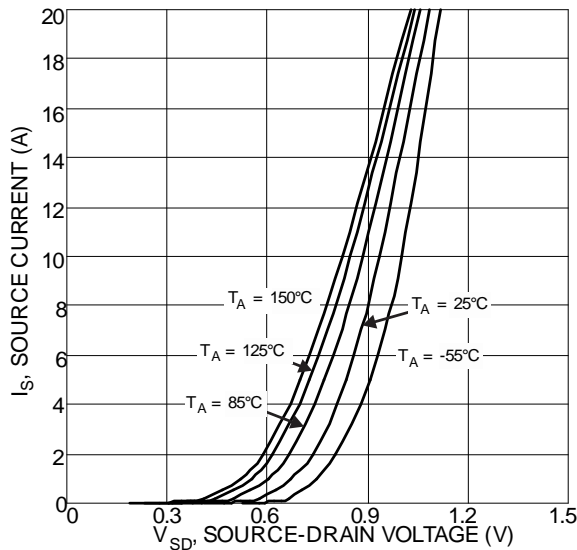


Figure 9 Diode Forward Voltage vs. Current

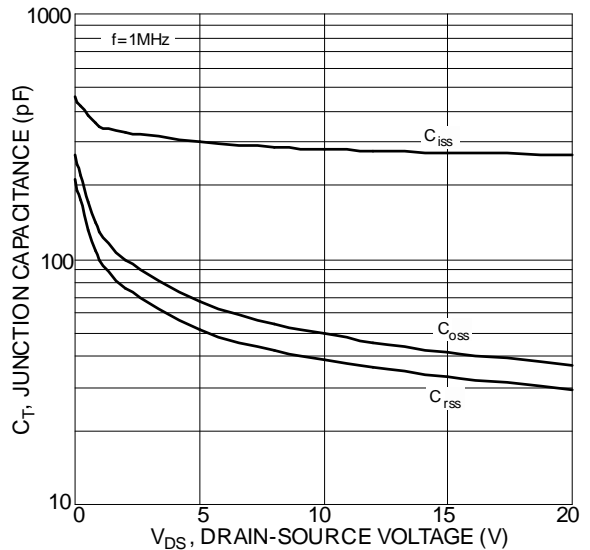


Figure 10 Typical Junction Capacitance

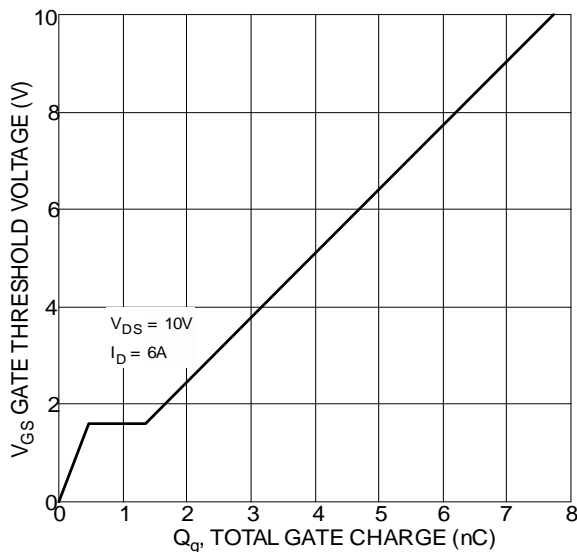


Figure 11 Gate Charge

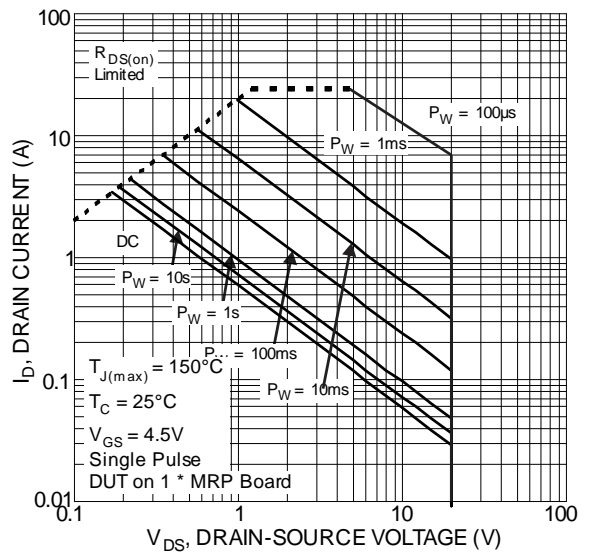
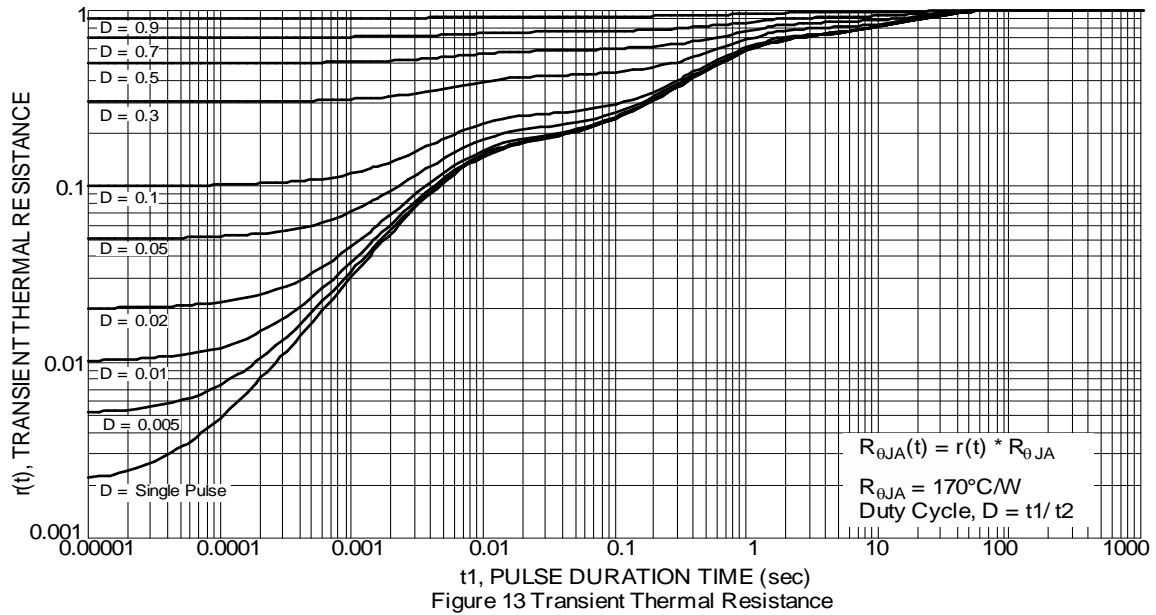


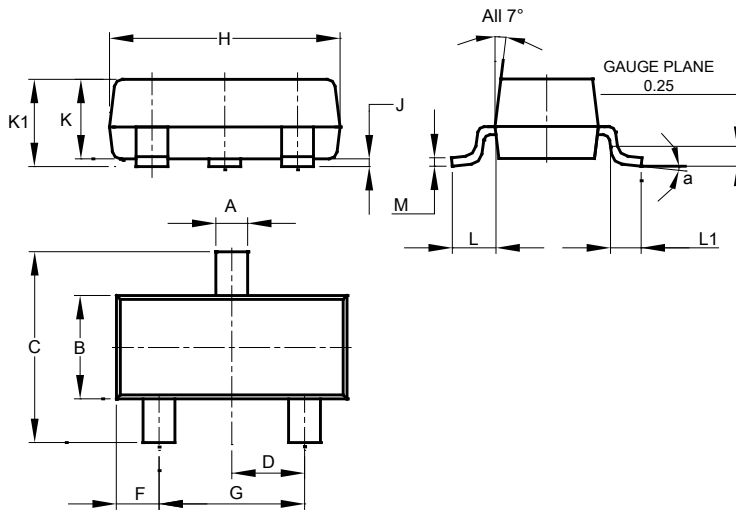
Figure 12 SOA, Safe Operation Area



**Package Outline Dimensions**

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

**SOT23**

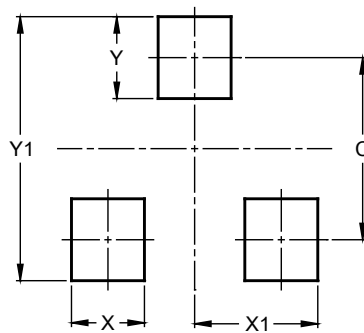


SOT23			
Dim	Min	Max	Typ
A	0.37	0.51	0.40
B	1.20	1.40	1.30
C	2.30	2.50	2.40
D	0.89	1.03	0.915
F	0.45	0.60	0.535
G	1.78	2.05	1.83
H	2.80	3.00	2.90
J	0.013	0.10	0.05
K	0.890	1.00	0.975
K1	0.903	1.10	1.025
L	0.45	0.61	0.55
L1	0.25	0.55	0.40
M	0.085	0.150	0.110
a	0°	8°	--
All Dimensions in mm			

**Suggested Pad Layout**

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

**SOT23**



Dimensions	Value (in mm)
C	2.0
X	0.8
X1	1.35
Y	0.9
Y1	2.9

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