N-CHANNEL ENHANCEMENT MODE FIELD EFFECT TRANSISTOR

Product Summary

BV_{DSS}	$R_{DS(ON)}$	I_D T_A = +25°C
100V	6.0Ω @ V_{GS} = 10V	0.17A

Features and Benefits

- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- High Drain-Source Voltage Rating
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e.: parts qualified to AEC-Q100/101/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please refer to the related automotive grade (Q-suffix) part. A listing can be found at https://www.diodes.com/products/automotive/automotive-products/.**
- **This part is qualified to JEDEC standards (as references in AEC-Q) for High Reliability. https://www.diodes.com/quality/product-definitions/**

Description and Applications

These N-Channel enhancement mode field effect transistors are produced using Diodes Incorporated's proprietary, high density and advanced trench technology. These products have been designed to minimize on-state resistance while providing rugged, reliable and fast switching performance. These products are particularly suited for low voltage, low current applications such as:

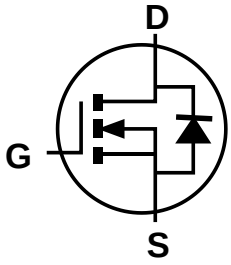
- Small Servo Motor Control
- Power MOSFET Gate Drivers
- Switching Applications

Mechanical Data

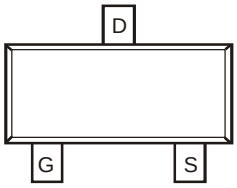
- Case: SOT23
- Case Material: Molded Plastic. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish Annealed over Alloy 42 Leadframe (Lead Free Plating). Solderable per MIL-STD-202, Method 208 e3
- Terminal Connections: See Diagram
- Weight: 0.008 grams (Approximate)

SOT23

Top View



Equivalent Circuit



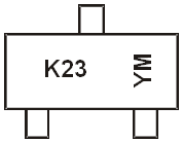
Top View

Ordering Information (Note 4)

Part Number	Case	Packaging
BSS123-7-F	SOT23	3,000/Tape & Reel
BSS123-13-F	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



K23 = Product Type Marking Code
YM = Date Code Marking
Y or $\overline{Y}$ = Year (ex: I = 2021)
M = Month (ex: 9 = September)

Date Code Key

Year	2002	…	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Code	O	…	I	J	K	L	M	N	O	P	R	S

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}	100	V
Gate-Source Voltage	Continuous	V_{GSS}	±20	V
Continuous Drain Current (Note 5) V_{GS} = 10V	Continuous	I_D	0.17	A
	Pulsed	I_{DM}	0.68	

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

Characteristic	Symbol	Max	Unit
Power Dissipation (Note 5)	P_D	300	mW
Thermal Resistance, Junction to Ambient @T_A = +25°C (Note 5)	$R_{\theta JA}$	417	°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 6)						
Drain-Source Breakdown Voltage	BV_{DSS}	100	—	—	V	V_{GS} = 0V, I_D = 250μA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	0.1	μA	V_{DS} = 100V, V_{GS} = 0V
		—	—	30	μA	V_{DS} = 100V, V_{GS} = 0V @ T_A = +150°C (Note 7)
		—	—	10	nA	V_{DS} = 20V, V_{GS} = 0V
Gate-Source Leakage, Forward	I_{GSSF}	—	—	50	nA	V_{GS} = 20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 6)						
Gate Threshold Voltage	$V_{GS(TH)}$	0.8	1.4	2.0	V	V_{DS} = V_{GS}, I_D = 1mA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	3.2	6.0	Ω	V_{GS} = 10V, I_D = 0.17A
		—	3.8	10		V_{GS} = 4.5V, I_D = 0.17A
Forward Transfer Admittance	g_{FS}	80	370	—	ms	V_{DS} =10V, I_D = 0.17A, f = 1.0kHz
Diode Forward Voltage	V_{SD}	—	0.84	1.3	V	V_{GS} = 0V, I_S = 0.34A
DYNAMIC CHARACTERISTICS (Note 7)						
Input Capacitance	C_{iss}	—	22	60	pF	V_{DS} = 25V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	—	3.5	15		
Reverse Transfer Capacitance	C_{rss}	—	2.0	6		
SWITCHING CHARACTERISTICS (Note 7)						
Turn-On Delay Time	$t_{D(ON)}$	—	—	8	ns	V_{GS} = 10V, V_{DD} = 30V I_D = 0.28A, R_{GEN} = 50Ω
Turn-On Rise Time	t_R	—	—	8	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	—	—	13	ns	
Turn-Off Fall Time	t_F	—	—	16	ns	

Notes: 5. Part mounted on FR-4 board with recommended pad layout, which can be found on our website at http://www.diodes.com/package-outlines.html.
6. Short duration pulse test used to minimize self-heating effect.
7. Guaranteed by design. Not subject to production testing.

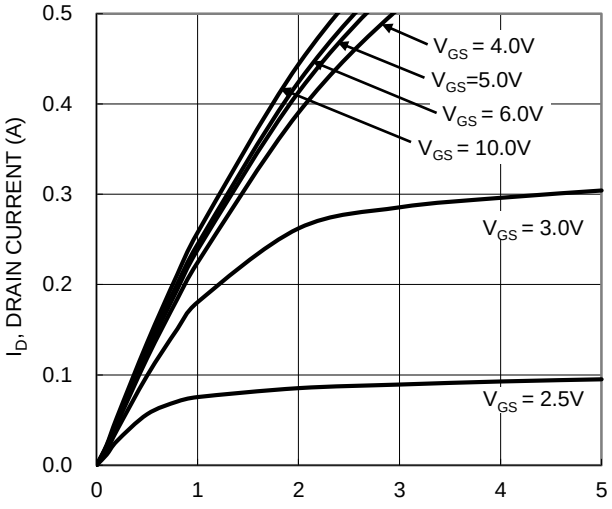


Figure 1. Typical Output Characteristic

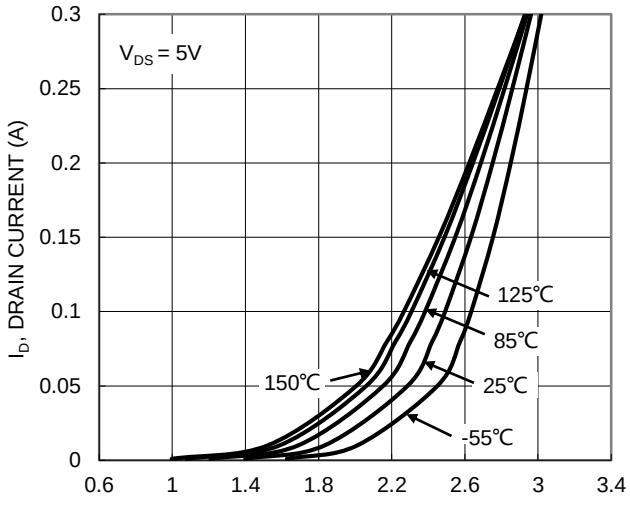


Figure 2. Typical Transfer Characteristic

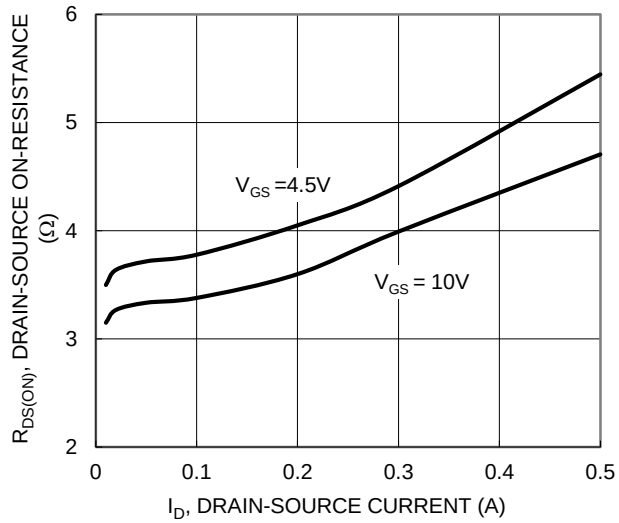


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

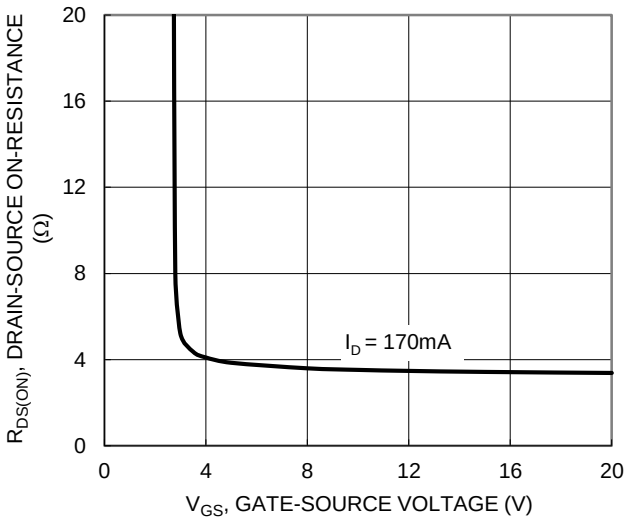


Figure 4. Typical Transfer Characteristic

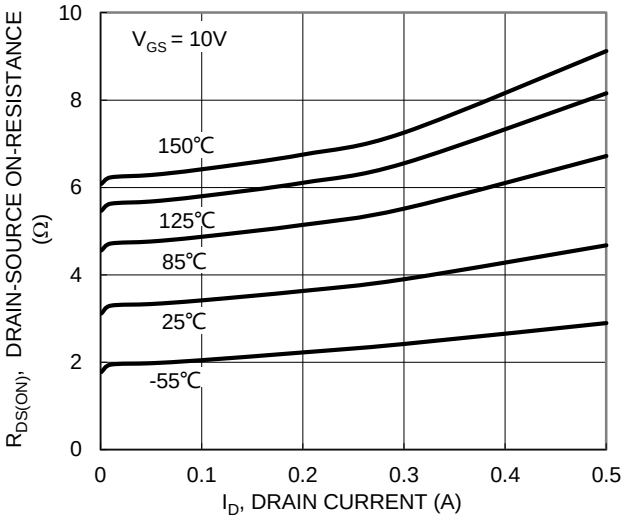


Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

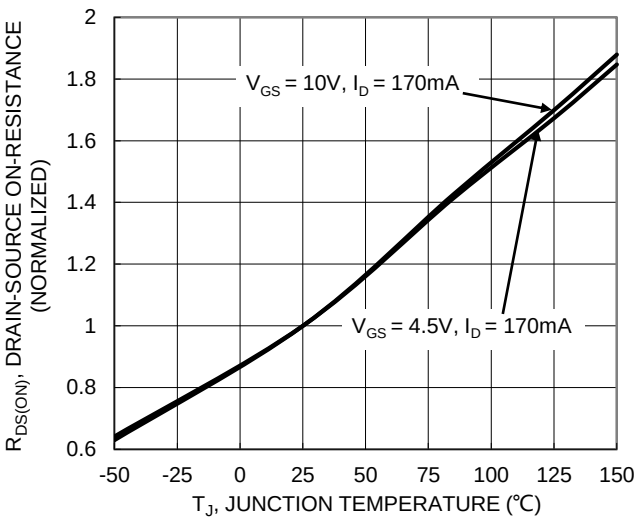


Figure 6. On-Resistance Variation with Junction Temperature

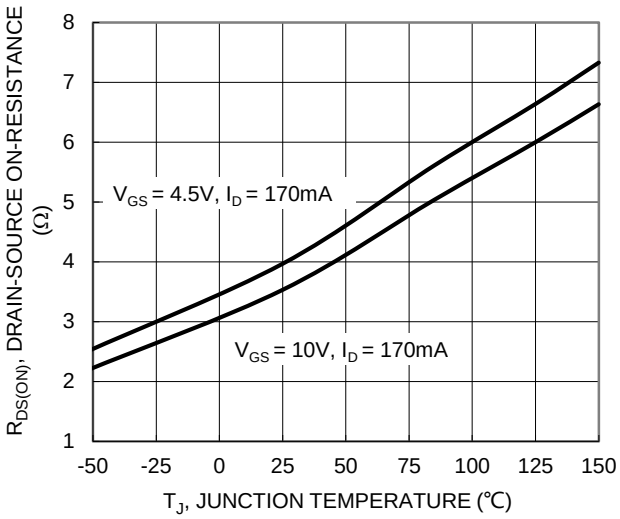


Figure 7. On-Resistance Variation with Junction Temperature

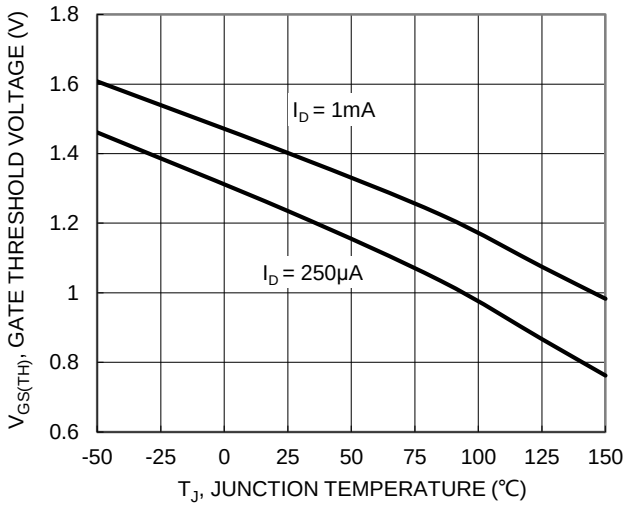


Figure 8. Gate Threshold Variation vs. Junction Temperature

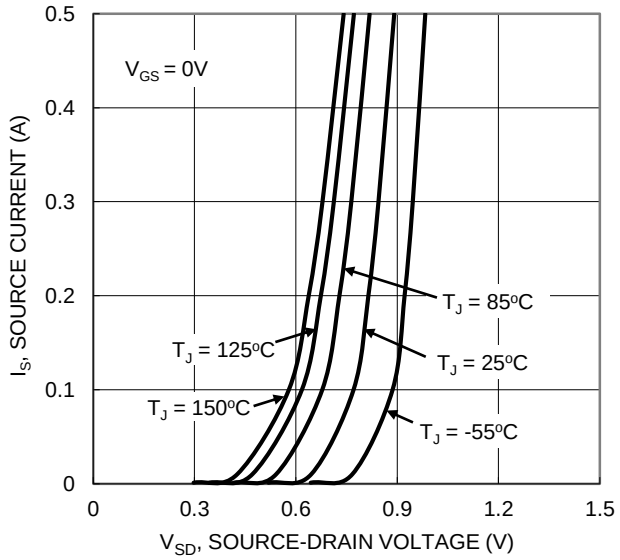


Figure 9. Diode Forward Voltage vs. Current

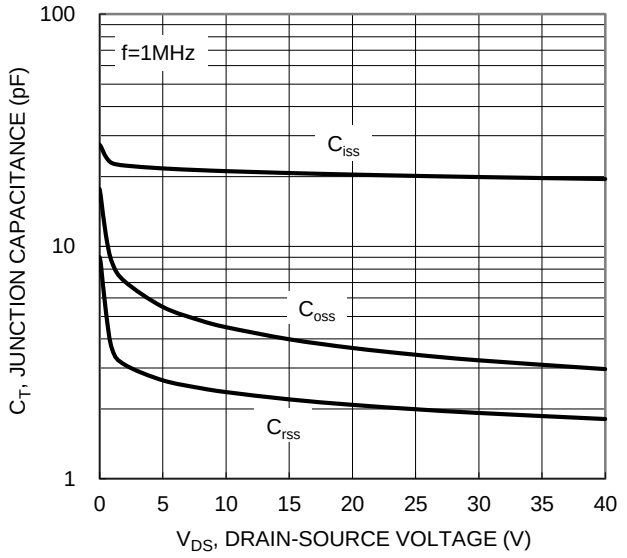


Figure 10. Typical Junction Capacitance

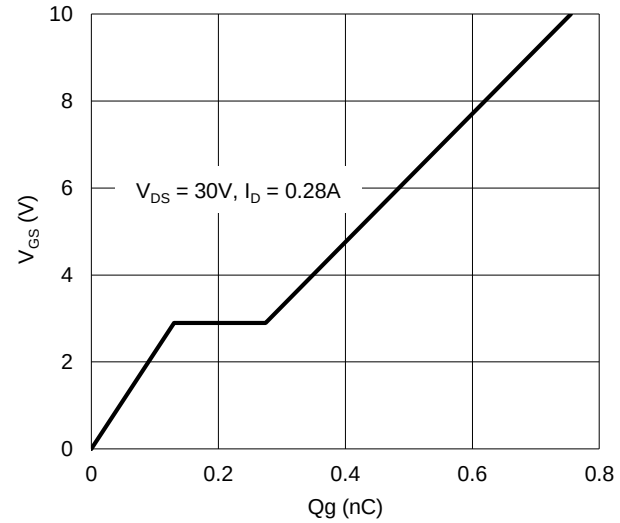


Figure 11. Gate Charge

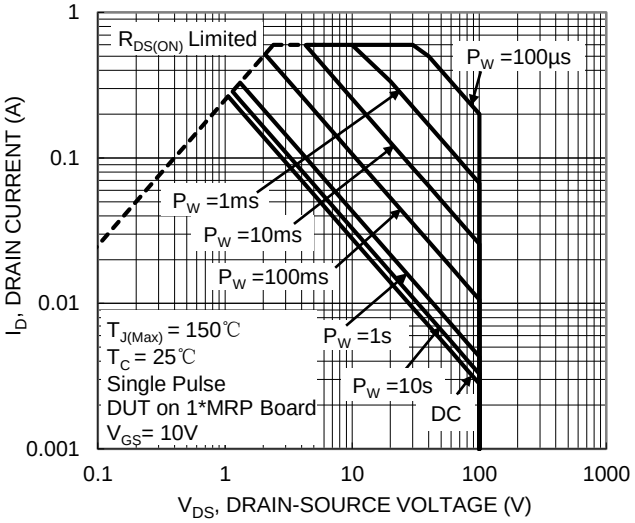


Figure 12. SOA, Safe Operation Area

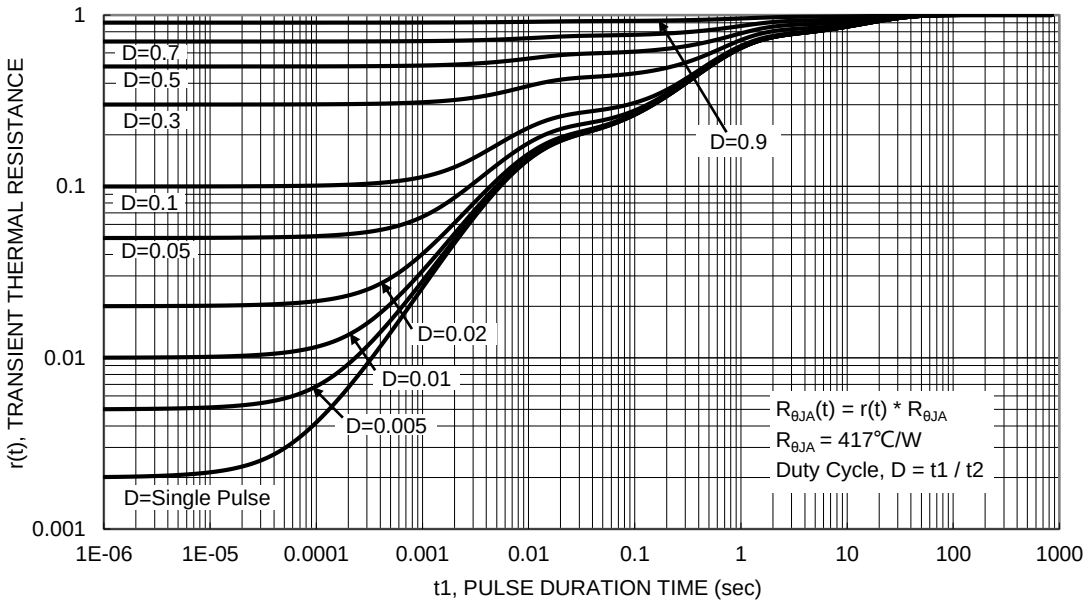
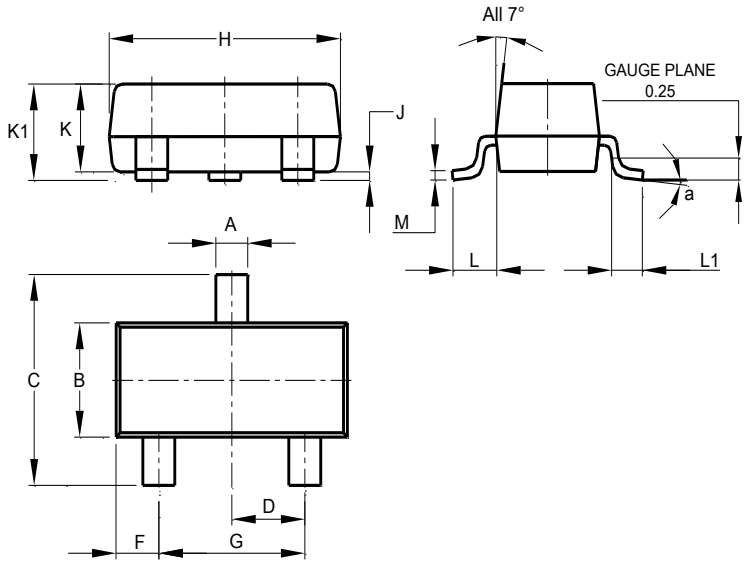


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

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

SOT23

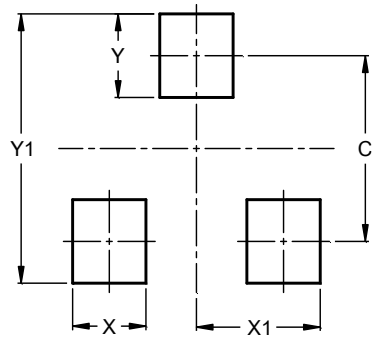


SOT23			
Dim	**Min**	**Max**	**Typ**
A	0.37	0.51	0.40
B	1.20	1.40	1.30
C	2.30	2.50	2.40
D	0.89	1.03	0.915
F	0.45	0.60	0.535
G	1.78	2.05	1.83
H	2.80	3.00	2.90
J	0.013	0.10	0.05
K	0.890	1.00	0.975
K1	0.903	1.10	1.025
L	0.45	0.61	0.55
L1	0.25	0.55	0.40
M	0.085	0.150	0.110
a	0°	8°	--
All Dimensions in mm			

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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