

INTEGRATED RELAY AND INDUCTIVE LOAD DRIVER
Product Summary

BV _{DSS}	R _{DS(ON)} Max	I _D Max T _A = +25°C
60V	1.8Ω @ V _{GS} = 5V	470mA
	2.4Ω @ V _{GS} = 3V	

Description and Applications

The DMN61D8LQ provides a single component solution for switching inductive loads such as relays, solenoids, and small DC motors in automotive applications, without the need of a freewheeling diode. DMN61D8LQ accepts logic level inputs, thus allowing it to be driven by logic gates, inverters, and microcontrollers.

Features and Benefits

- Provides A More Reliable And Robust Interface Between Sensitive Logic And DC Relay Coils
- Replaces 3 to 4 Discrete Components Enabling PCB Footprint To Be Reduced
- Internal Active Clamp Removes The Need For External Zener Diode
- **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**
- **PPAP Capable (Note 4)**

Mechanical Data

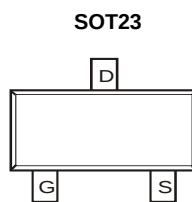
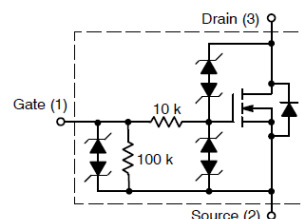
- Case: SOT23
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish Annealed over Alloy 42 Leadframe (Lead-Free Plating). Solderable per MIL-STD-202, Method 208 (3)
- Terminal Connections: See Diagram
- Weight: 0.008 grams (Approximate)



ESD protected



Top View

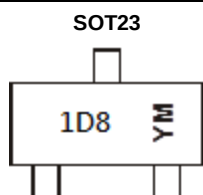

 Top View
Internal Schematic


Equivalent Circuit

Ordering Information (Note 5)

Part Number	Case	Packaging
DMN61D8LQ-7	SOT23	3,000/Tape & Reel
DMN61D8LQ-13	SOT23	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 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. Automotive products are AEC-Q101 qualified and are PPAP capable. Refer to http://www.diodes.com/product_compliance_definitions.html.
 5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

Marking Information


1D8 = Product Type Marking Code
 YM = Date Code Marking
 Y = Year (ex: D = 2016)
 M = Month (ex: 9 = September)

Date Code Key

Date Code Key

Year	2016	2017	2018	2019	2020	2021	2022
Code	D	E	F	G	H	I	J

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}	60	V
Gate-Source Voltage			V _{GSS}	±12	V
Continuous Drain Current (Note 7)	Steady State	T _A = +25°C T _A = +70°C	I _D	470 370	mA
Maximum Continuous Body Diode Forward Current (Note 6)			I _S	0.5	A
Single Pulse Drain-to-Source Avalanche Energy (For Relay's Coils/Inductive Loads of 80Ω or Higher) (T _J Initial = +85°C)			E _Z	200	mJ
Peak Power Dissipation, Drain-to-Source (Non repetitive current square pulse 1.0ms duration) (T _J Initial = +85°C)			P _{PK}	20	W
Load Dump Pulse, Drain-to-Source, R _{SOURCE} = 0.5Ω, t = 300ms) (For Relay's Coils/Inductive Loads of 80Ω or Higher) (T _J Initial = +85°C)			E _{LD1}	60	V
Inductive Switching Transient 1, Drain-to-Source (Waveform: R _{SOURCE} = 10Ω, t = 2.0ms) (For Relay's Coils/Inductive Loads of 80Ω or Higher) (T _J Initial = +85°C)			E _{LD2}	100	V
Inductive Switching Transient 2, Drain-to-Source (Waveform: R _{SOURCE} = 4.0Ω, t = 50μs) (For Relay's Coils/Inductive Loads of 80Ω or Higher) (T _J Initial = +85°C)			E _{LD3}	300	V
Reverse Battery, 10 Minutes (Drain-to-Source) (For Relay's Coils/Inductive Loads of 80Ω or more)			Rev-Bat	-14	V
Dual Voltage Jump Start, 10 Minutes (Drain-to-Source)			Dual-Volt	28	V
ESD Human Body Model (HBM)			ESD	4,000	V

Thermal Characteristics

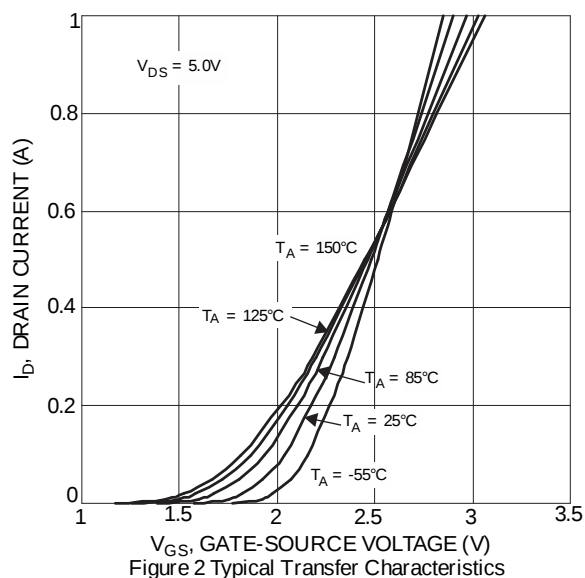
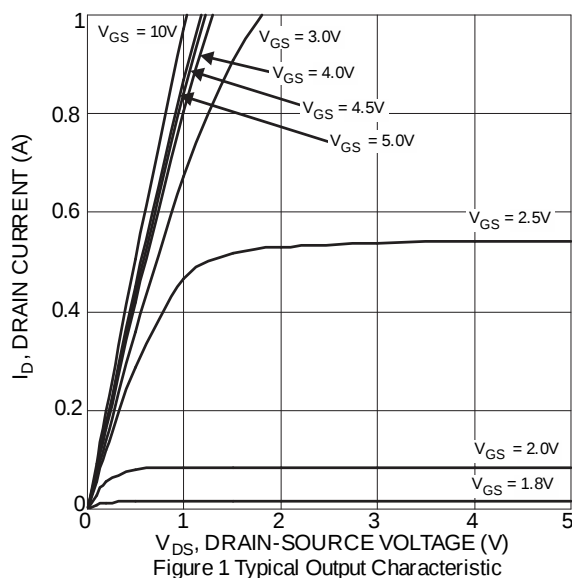
Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 6)		P _D	390	mW
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	R _{θJA}	321	°C/W
Total Power Dissipation (Note 7)		P _D	610	mW
Thermal Resistance, Junction to Ambient (Note 7)	Steady State	R _{θJA}	208	°C/W
Operating and Storage Temperature Range		T _J , T _{STG}	-55 to +150	°C

Notes: 6. Device mounted on FR-4 PCB, with minimum recommended pad layout.
7. Device mounted on 1" x 1" FR-4 PCB with high coverage 2oz. copper, single sided.

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 8)						
Drain-Source Breakdown Voltage	BV _{DSS}	60	—	—	V	V _{GS} = 0V, I _D = 10mA
Zero Gate Voltage Drain Current	I _{DSS}	—	—	50 0.5	μA	V _{DS} = 60V, V _{GS} = 0V V _{DS} = 12V, V _{GS} = 0V
Gate-Source Leakage	I _{GSS}	—	—	±90 ±60	μA	V _{GS} = ±5V, V _{DS} = 0V V _{GS} = ±3V, V _{DS} = 0V
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	V _{GS(TH)}	1.3	—	2.0	V	V _{DS} = V _{GS} , I _D = 1mA
Static Drain-Source On-Resistance	R _{DS(ON)}	—	1.1	1.8	Ω	V _{GS} = 5V, I _D = 0.15A
			1.4	2.4		V _{GS} = 3V, I _D = 0.15A
Forward Transfer Admittance	Y _{fs}	80	—	—	ms	V _{DS} = 12V, I _D = 0.15A
Diode Forward Voltage	V _{SD}	—	—	1.2	V	V _{GS} = 0V, I _S = 0.15A
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C _{iss}	—	12.9	—	pF	V _{DS} = 12V, V _{GS} = 0V f = 1.0MHz
Output Capacitance	C _{oss}	—	17	—	pF	
Reverse Transfer Capacitance	C _{rss}	—	0.84	—	pF	
Total Gate Charge	Q _g	—	0.74	—	nC	V _{GS} = 5V, V _{DS} = 12V, I _D = 150mA
Gate-Source Charge	Q _{gs}	—	0.19	—	nC	
Gate-Drain Charge	Q _{gd}	—	0.16	—	nC	
Turn-On Delay Time	t _{D(ON)}	—	131	—	ns	V _{DD} = 12V, V _{GS} = 5V.
Turn-On Rise Time	t _r	—	301	—	ns	
Turn-Off Delay Time	t _{D(OFF)}	—	582	—	ns	
Turn-Off Fall Time	t _f	—	440	—	ns	

Notes: 8. Short duration pulse test used to minimize self-heating effect.
9. Guaranteed by design. Not subject to product testing.



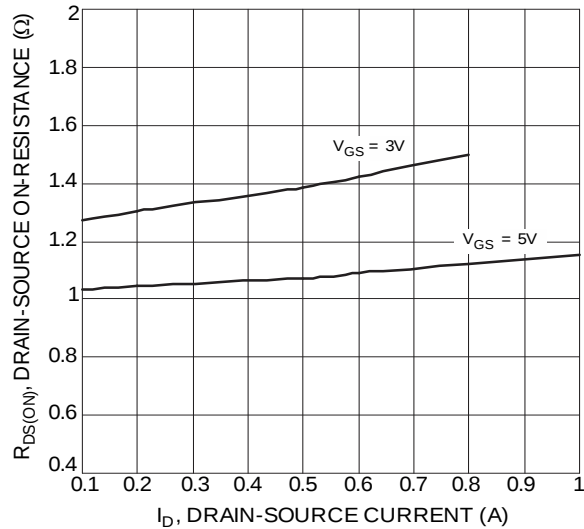


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

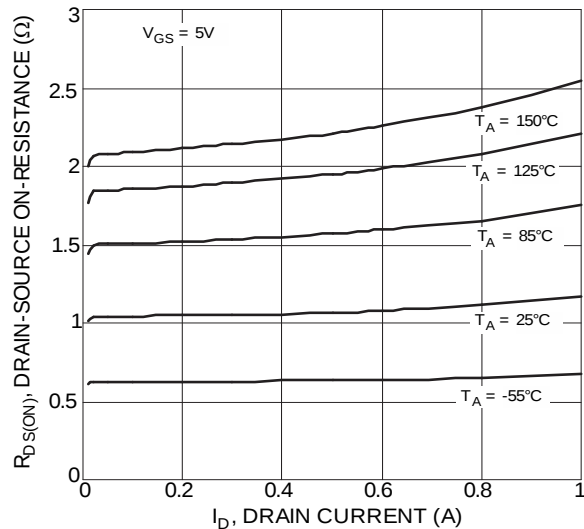


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

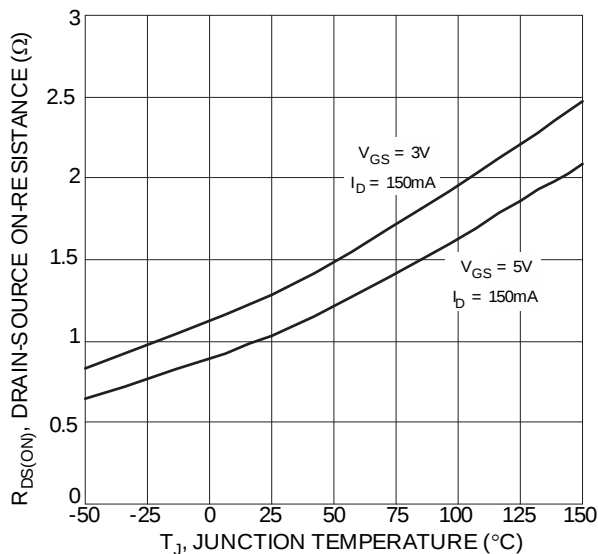


Figure 7 On-Resistance Variation with Temperature

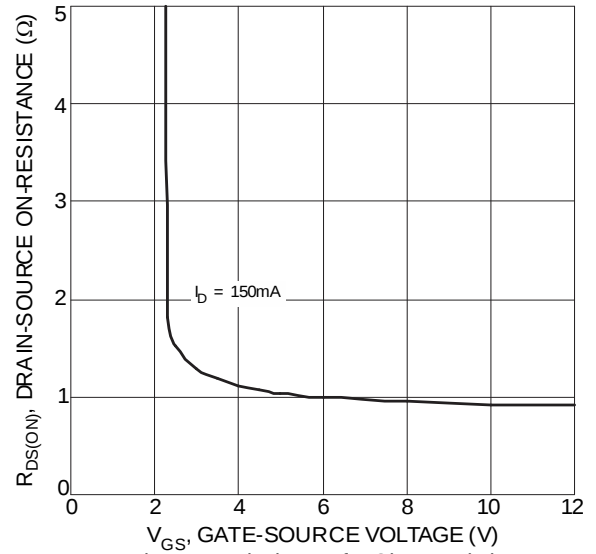


Figure 4 Typical Transfer Characteristic

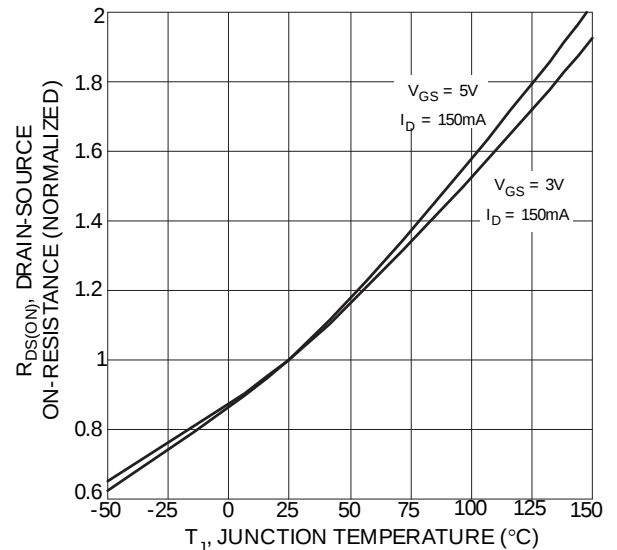


Figure 6 On-Resistance Variation with Temperature

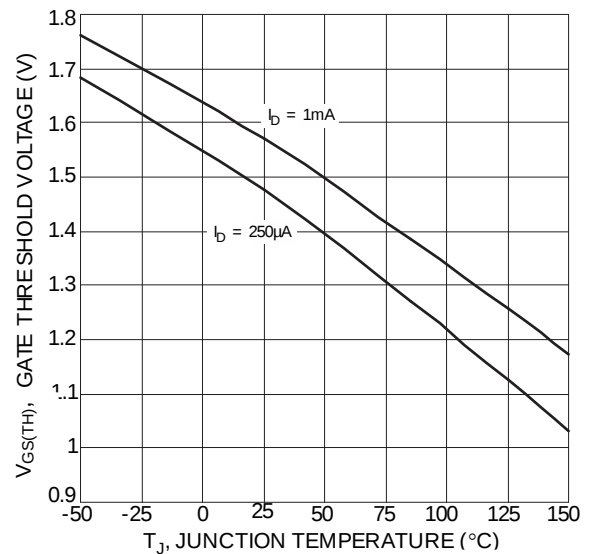


Figure 8 Gate Threshold Variation vs. Junction Temperature

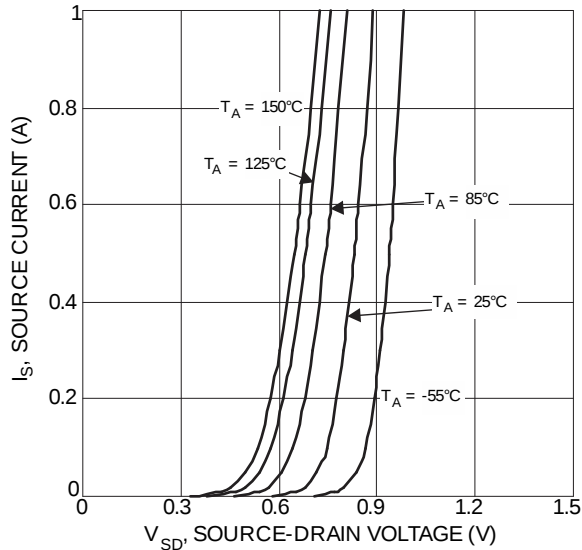


Figure 9 Diode Forward Voltage vs. Current

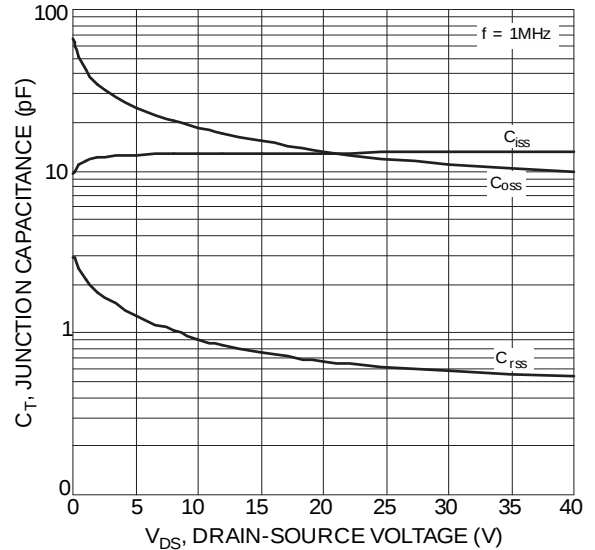


Figure 10 Typical Junction Capacitance

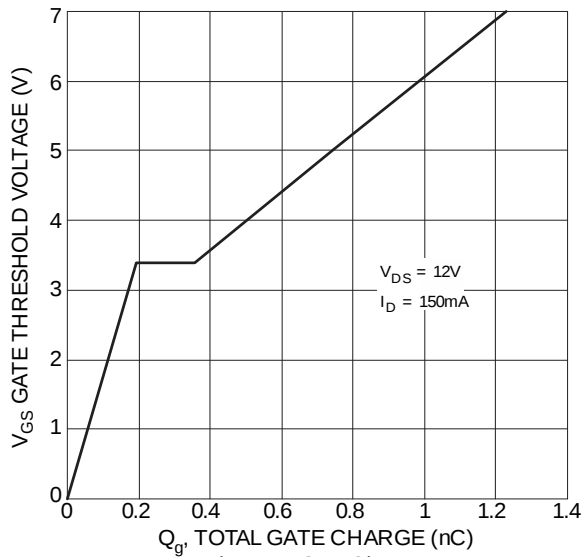


Figure 11 Gate Charge

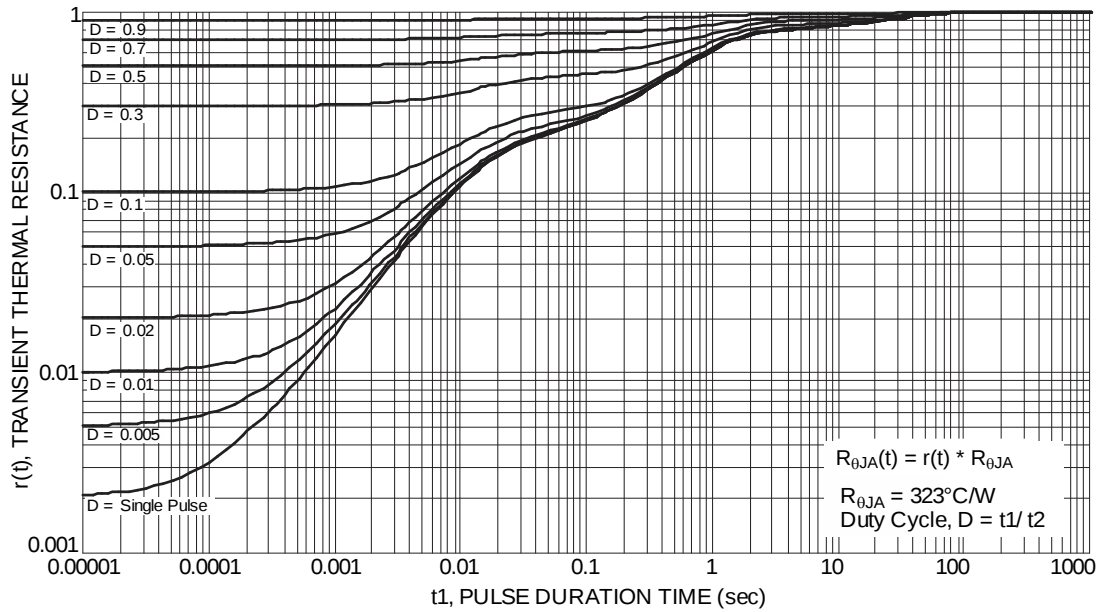
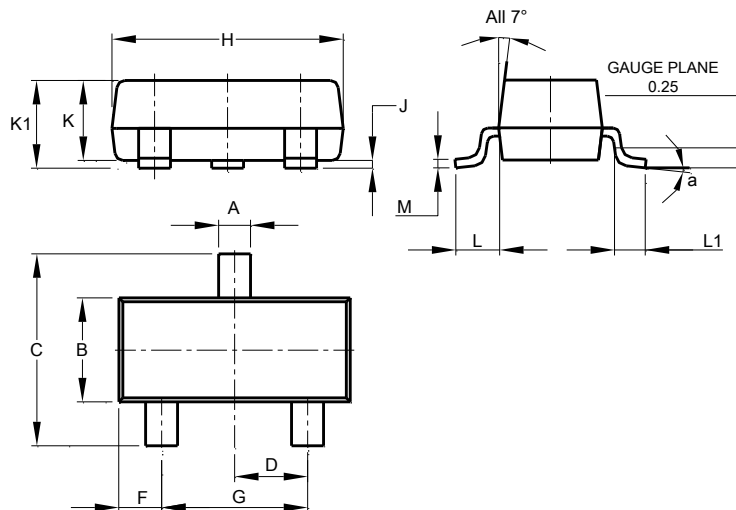


Figure 12 Transient Thermal Resistance

Package Outline Dimensions

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

SOT23

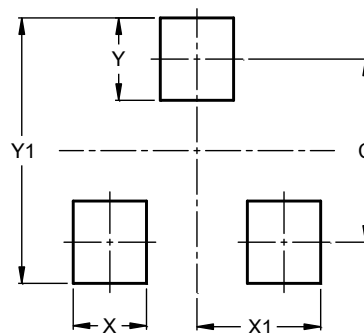


SOT23			
Dim	Min	Max	Typ
A	0.37	0.51	0.40
B	1.20	1.40	1.30
C	2.30	2.50	2.40
D	0.89	1.03	0.915
F	0.45	0.60	0.535
G	1.78	2.05	1.83
H	2.80	3.00	2.90
J	0.013	0.10	0.05
K	0.890	1.00	0.975
K1	0.903	1.10	1.025
L	0.45	0.61	0.55
L1	0.25	0.55	0.40
M	0.085	0.150	0.110
a	0°	8°	--
All Dimensions in mm			

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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