DUAL N-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

BV_{DSS}	$R_{DS(ON)}$ Max	I_D Max T_A = +25°C (Note 6)
40V	31mΩ @ V_{GS} = 10V	7.0A
	50mΩ @ V_{GS} = 4.5V	5.8A

Features and Benefits

- Low On-Resistance
- Low Input/Output Leakage
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **This part is qualified to JEDEC standards (as references in AEC-Q) for High Reliability.**
  https://www.diodes.com/quality/product-definitions/
- **An Automotive-Compliant Part is Available Under Separate Datasheet (DMN4031SSDQ)**

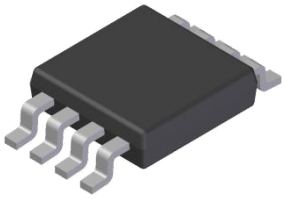
Description and Applications

This MOSFET is designed to minimize the on-state resistance ($R_{DS(ON)}$) yet maintain superior switching performance, making it ideal for high efficiency power management applications.

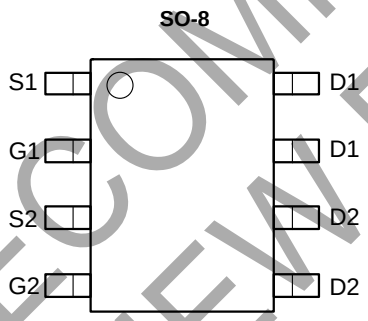
- Motor controls
- Backlighting
- Power management functions
- DC-DC converters

Mechanical Data

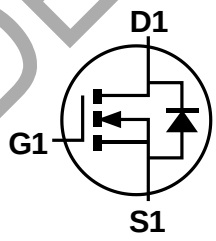
- Package: SO-8
- Package Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections Indicator: See Diagram
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.072 grams (Approximate)



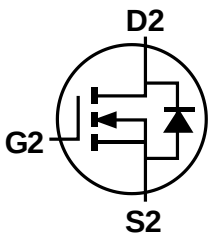
Top View



Top View



N-Channel MOSFET



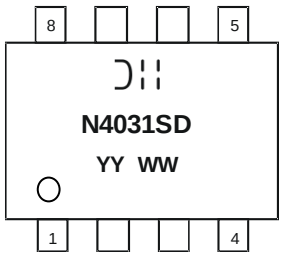
N-Channel MOSFET

Ordering Information (Note 4)

Part Number	Package	Packing	
		Qty.	Carrier
DMN4031SSD-13	SO-8	2,500	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



= Manufacturer's Marking
N4031SD = Product Type Marking Code
YYWW = Date Code Marking
YY or $\overline{YY}$ = Year (ex: 23 = 2023)
WW = Week (01 to 53)

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Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DSS}	40	V
Gate-Source Voltage			V_{GSS}	±20	V
Continuous Drain Current (Note 5) (V_{GS} = 10V)	Steady State	T_A = +25°C T_A = +70°C	I_D	5.2 4.1	A
Continuous Drain Current (Note 5) (V_{GS} = 4.5V)	Steady State	T_A = +25°C T_A = +70°C	I_D	4.3 3.4	A
Continuous Drain Current (Note 6) (V_{GS} = 10V)	Steady State	T_A = +25°C T_A = +70°C	I_D	7.0 5.6	A
Continuous Drain Current (Note 6) (V_{GS} = 4.5V)	Steady State	T_A = +25°C T_A = +70°C	I_D	5.8 4.7	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)			I_{DM}	40	A
Maximum Continuous Body Diode Forward Current (Note 6)			I_S	2.2	A
Pulsed Body Diode Forward Current (10µs Pulse, Duty Cycle = 1%)			I_{SM}	40	A
Avalanche Current, L = 0.1mH (Note 7)			I_{AS}	11	A
Avalanche Energy, L = 0.1mH (Note 7)			E_{AS}	18	mJ

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

Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 5)	P_D	1.42	W
Thermal Resistance, Junction to Ambient @T_A = +25°C (Note 5)	$R_{\theta JA}$	88	°C/W
Total Power Dissipation (Note 6)	P_D	2.6	W
Thermal Resistance, Junction to Ambient @T_A = +25°C (Note 6)	$R_{\theta JA}$	48	°C/W
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. The value in any given application depends on user's specific board design.
6. Device mounted on 1" x 1" FR-4PCB with high coverage 1 oz. copper, single sided.
7. I_{AS} and E_{AS} ratings are based on low frequency and duty cycles to keep T_J = +25°C.

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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}	40	—	—	V	V_{GS} = 0V, I_D = 10mA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1	μA	V_{DS} = 40V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	$V_{GS(TH)}$	1.6	2.4	3.0	V	V_{DS} = V_{GS}, I_D = 250μA
On-State Drain Current	$I_{D(ON)}$	20	—	—	A	V_{GS} = 10V, V_{DS} = 5A
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	19	31	mΩ	V_{GS} = 10V, I_D = 6A
		—	44	50		V_{GS} = 4.5V, I_D = 5A
Forward Transfer Admittance	$\|Y_{FS}\|$	—	11	—	S	V_{DS} = 5V, I_D = 6A
Diode Forward Voltage	V_{SD}	—	0.74	1.0	V	V_{GS} = 0V, I_S = 1A
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{iss}	—	945	—	pF	V_{DS} = 20V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	—	69	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	58	—	pF	
Gate Resistance	R_g	—	1.45	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1.0MHz
Total Gate Charge (V_{GS} = 4.5V)	Q_g	—	8.4	—	nC	V_{GS} = 10V, V_{DS} = 20V, I_D = 12A
Total Gate Charge (V_{GS} = 10V)	Q_g	—	18.6	—	nC	
Gate-Source Charge	Q_{gs}	—	3.3	—	nC	
Gate-Drain Charge	Q_{gd}	—	2.2	—	nC	
Turn-On Delay Time	$t_{D(ON)}$	—	6.4	—	ns	V_{GS} = 10V, V_{DS} = 20V, R_L = 1.6Ω, R_G = 3Ω
Turn-On Rise Time	t_R	—	9.7	—	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	—	19.8	—	ns	
Turn-Off Fall Time	t_F	—	3.1	—	ns	

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

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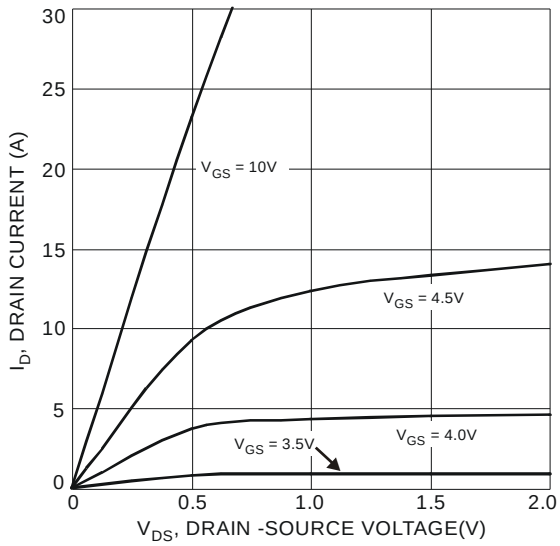


Fig. 1 Typical Output Characteristics

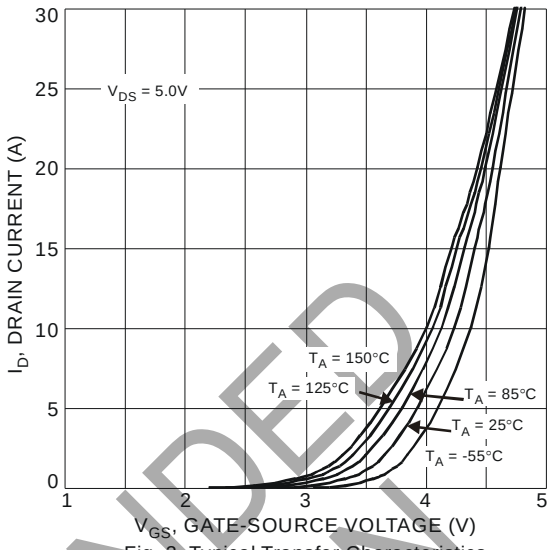


Fig. 2 Typical Transfer Characteristics

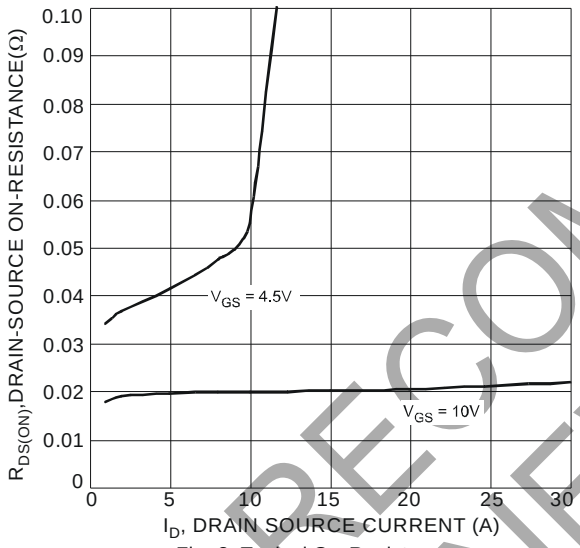


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

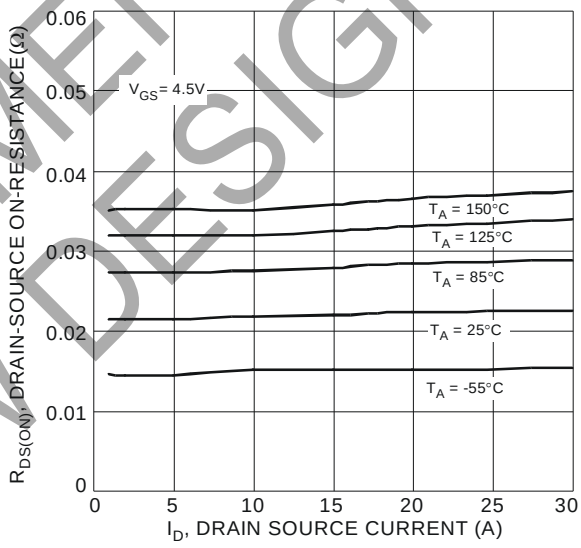


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

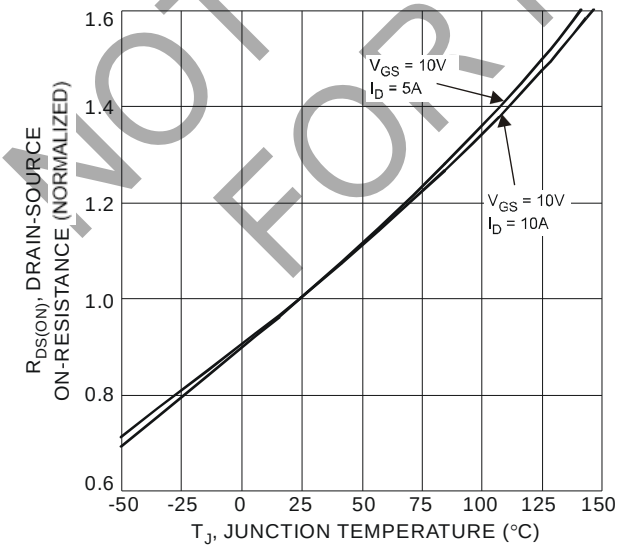


Fig. 5 On-Resistance Variation with Temperature

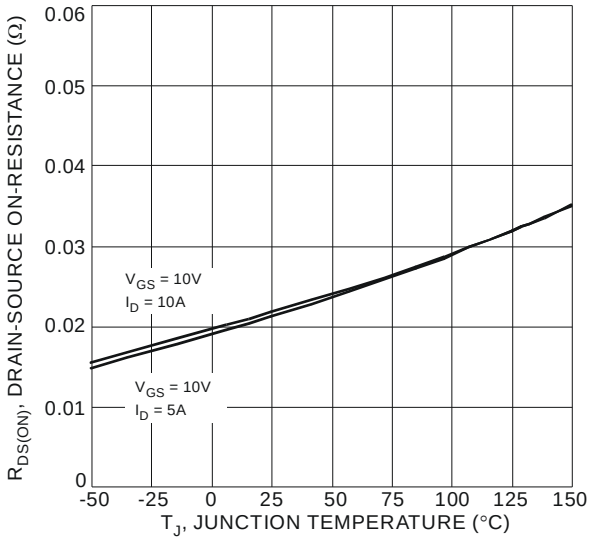


Fig. 6 On-Resistance Variation with Temperature

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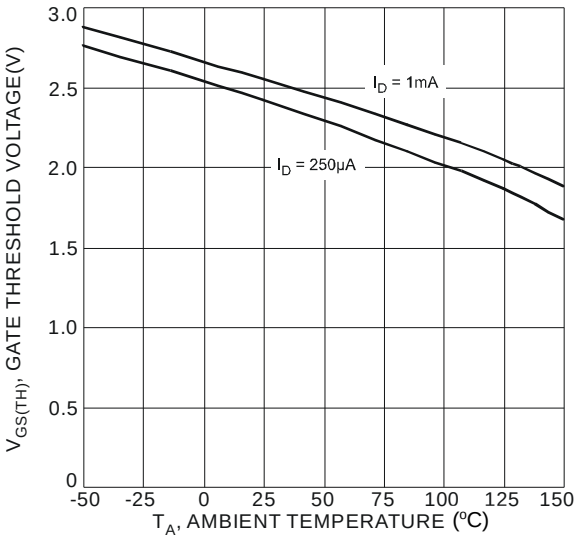


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

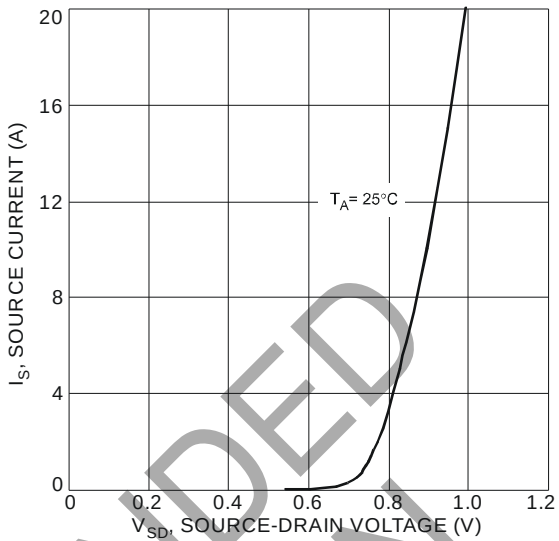


Fig. 8 Diode Forward Voltage vs. Current

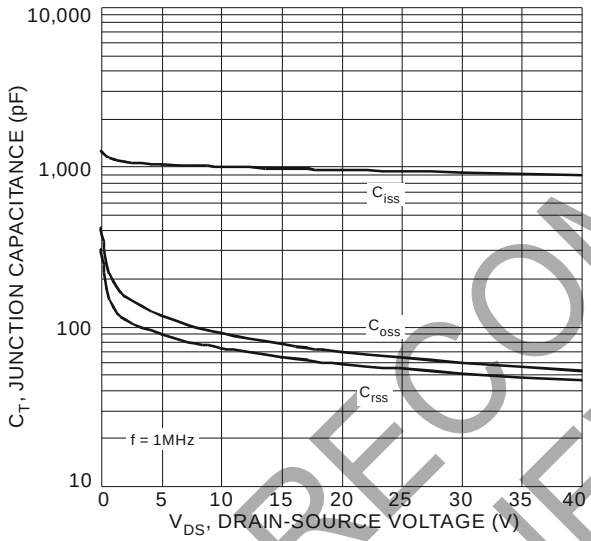


Fig. 9 Typical Junction Capacitance

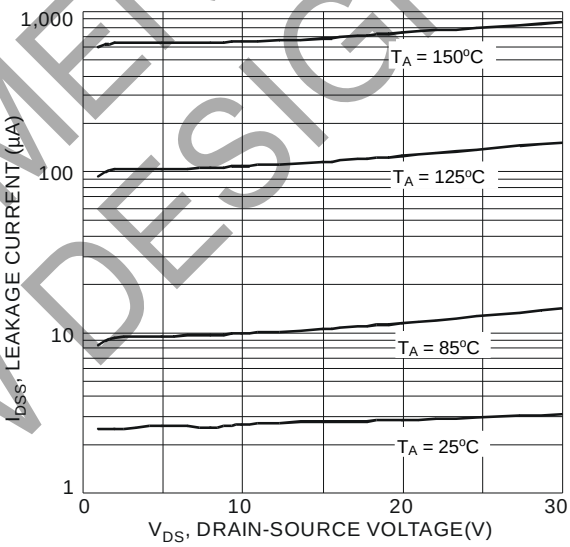


Fig. 10 Typical Drain-Source Leakage Current vs. Voltage

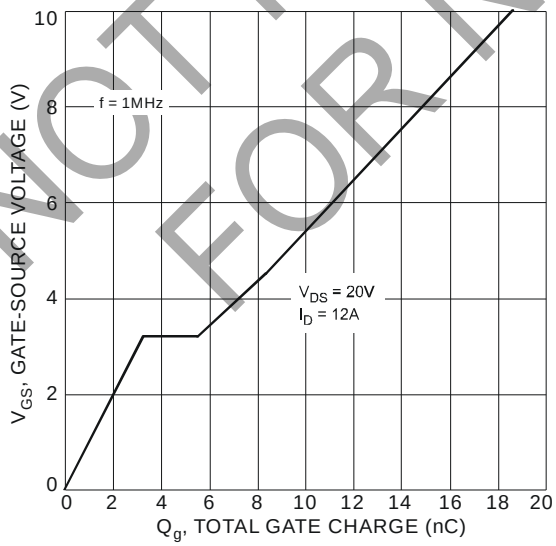


Fig. 11 Gate-Charge Characteristics

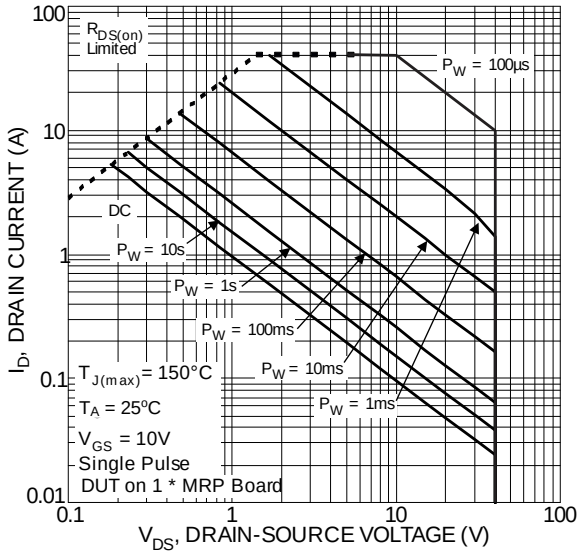


Fig. 12 SOA, Safe Operation Area

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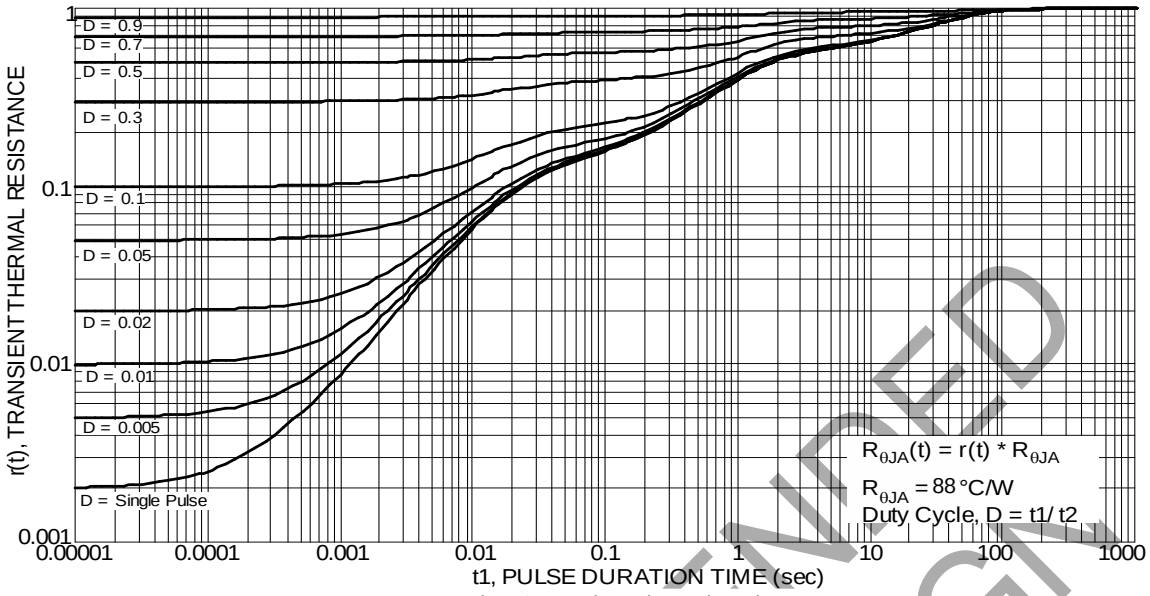


Fig. 13 Transient Thermal Resistance

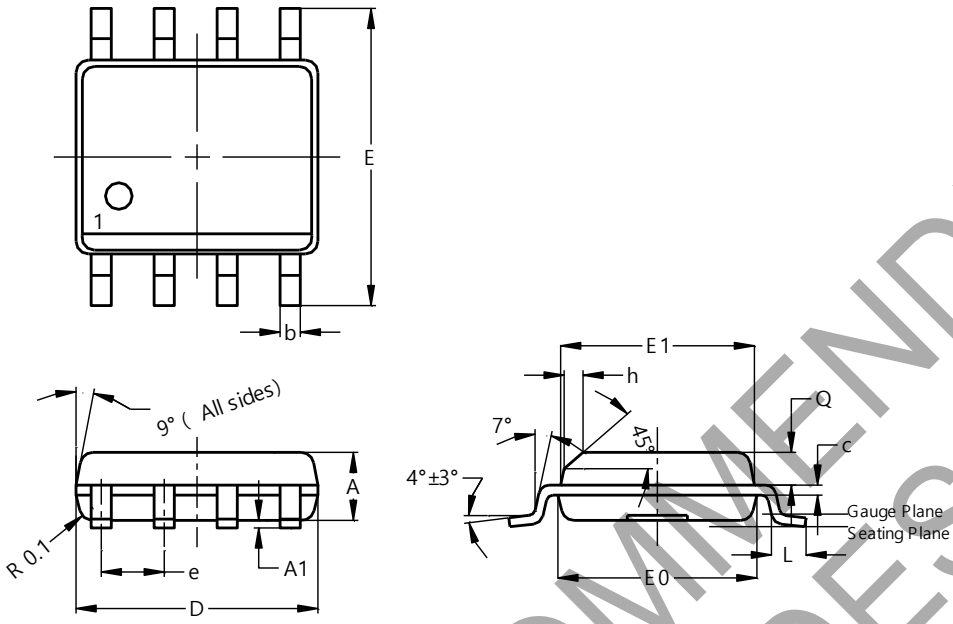
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Package Outline Dimensions

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

SO-8

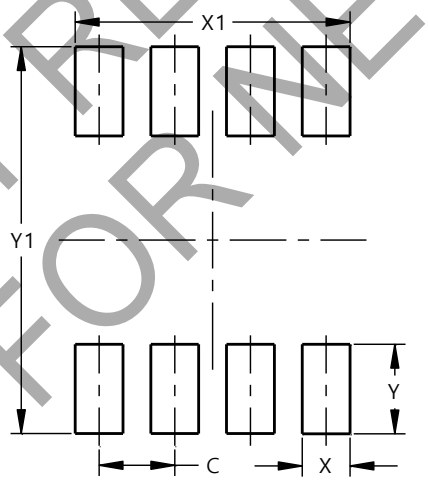


SO-8			
Dim	**Min**	**Max**	**Typ**
A	1.40	1.50	1.45
A1	0.10	0.20	0.15
b	0.30	0.50	0.40
c	0.15	0.25	0.20
D	4.85	4.95	4.90
E	5.90	6.10	6.00
E1	3.80	3.90	3.85
E0	3.85	3.95	3.90
e	–	–	1.27
h	–	–	0.35
L	0.62	0.82	0.72
Q	0.60	0.70	0.65
All Dimensions in mm			

Suggested Pad Layout

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

SO-8



Dimensions	Value (in mm)
C	1.27
X	0.802
X1	4.612
Y	1.505
Y1	6.50

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