P-CHANNEL ENHANCEMENT MODE MOSFET WITH INTEGRATED SCHOTTKY DIODE

Product Summary

MOSFET		
BV_{DSS}	$R_{DS(on)\ Max}$	I_D
-20V	85mΩ @ V_{GS} = -10V	-3.3A
	125mΩ @ V_{GS} = -4.5V	-2.8A
SCHOTTKY DIODE		
V_R	$V_{F\ Max}$	I_O
20V	400mV @ I_F = 0.5A	1.0A
	470mV @ I_F = 1.0A	

Description

This new generation 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.

Applications

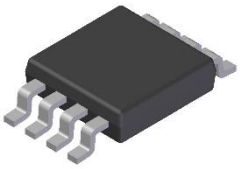
- DC-DC Converters
- Power Management Functions
- Backlighting

Features and Benefits

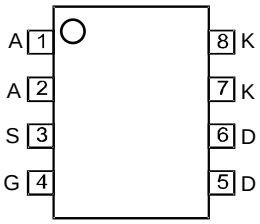
- Low Input Capacitance
- MOSFET with Low $R_{DS(ON)}$ – Minimize Conduction Losses
- Schottky Diode with Low Forward Voltage Drop
- Fast Switching Speed
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications 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/**

Mechanical Data

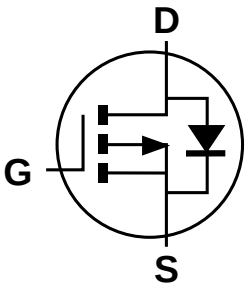
- Package: SO-8
- Package Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.074 grams (Approximate)



Top View



Top View



Q1 P-Channel MOSFET

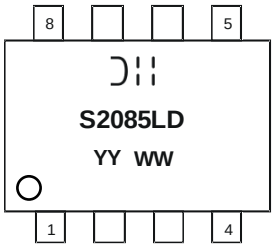
D1 Schottky Diode

Ordering Information (Note 4)

Part Number	Package	Packing	
		Qty.	Carrier
DMS2085LSD-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
S2085LD = Product Type Marking Code
YYWW = Date Code Marking
YY or $\overline{YY}$ = Year (ex: 21 = 2021)
WW = Week (01 to 53)

Maximum Ratings – P-CHANNEL MOSFET – Q1 (@T_A = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V_{DSS}	-20	V
Gate-Source Voltage			V_{GSS}	±20	V
Continuous Drain Current (Note 6) V_{GS} = 10V	Steady State	T_A = +25°C T_A = +70°C	I_D	-3.3 -2.7	A
	t<10s	T_A = +25°C T_A = +70°C	I_D	-4.3 -3.4	A
Maximum Body Diode Forward Current (Note 6)			I_S	-1.5	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)			I_{DM}	-11.2	A
Avalanche Current (Note 7) L = 0.1mH			I_{AS}	-12	A
Avalanche Energy (Note 7) L = 0.1mH			E_{AS}	7	mJ

Maximum Ratings – SCHOTTKY – D1 (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Peak Repetitive Reverse Voltage Working Peak Reverse Voltage DC Blocking Voltage	V_{RRM} V_{RWM} V_R	20	V
Average Rectified Output Current (Note 7, t<10s)	I_O	1	A
Peak Repetitive Forward Current (Note 7, t<10s)	I_{FRM}	2	A
Non-Repetitive Peak Forward Surge Current (Note 7, t<10s) Single Half Sine-Wave Superimposed on Rated Load	I_{FSM}	20	A

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

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)	T_A = +25°C	P_D	1.1	W
	T_A = +70°C		0.7	
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	108	°C/W
	t<10s		65	
Total Power Dissipation (Note 6)	T_A = +25°C	P_D	1.8	W
	T_A = +70°C		1.0	
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	78	°C/W
	t<10s		50	
Thermal Resistance, Junction to Case (Note 6)		$R_{\theta JC}$	22	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

Notes: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
6. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
7. I_{AS} and E_{AS} ratings are based on low frequency and duty cycles to keep T_J = +25°C.

Electrical Characteristics P-Channel Q1 (@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}	-20	—	—	V	V_{GS} = 0V, I_D = -250µA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	-1	µA	V_{DS} = -20V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	$V_{GS(th)}$	-0.5	-1.5	-2.2	V	V_{DS} = V_{GS}, I_D = -250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	70	85	mΩ	V_{GS} = -10V, I_D = -3.05A
		—	100	125		V_{GS} = -4.5V, I_D = -1.50A
Diode Forward Voltage	V_{SD}	—	-0.8	-1.0	V	V_{GS} = 0V, I_S = -1.0A
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{iss}	—	353	—	pF	V_{DS} = -15V, V_{GS} = 0V f = 1.0MHz
Output Capacitance	C_{oss}	—	49	—		
Reverse Transfer Capacitance	C_{rss}	—	41	—		
Gate Resistance	R_G	—	6.2	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1.0MHz
Total Gate Charge (V_{GS} = -4.5V)	Q_g	—	3.7	—	nC	V_{DS} = -15V, I_D = -3A
Total Gate Charge (V_{GS} = -10V)	Q_g	—	7.8	—		
Gate-Source Charge	Q_{gs}	—	1.1	—		
Gate-Drain Charge	Q_{gd}	—	1.3	—		
Turn-On Delay Time	$t_{D(on)}$	—	3.3	—	ns	V_{DS} = -15V,R_L = 15Ω V_{GS} = -10V, R_G = 6Ω
Turn-On Rise Time	t_r	—	3.0	—		
Turn-Off Delay Time	$t_{D(off)}$	—	14	—		
Turn-Off Fall Time	t_f	—	6.8	—		
Body Diode Reverse Recovery Time	t_{rr}	—	33	—	ns	I_S = -3.05A, dI/dt = 100A/µs
Body Diode Reverse Recovery Charge	Q_{rr}	—	46	—	nC	I_S = -3.05A, dI/dt = 100A/µs

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

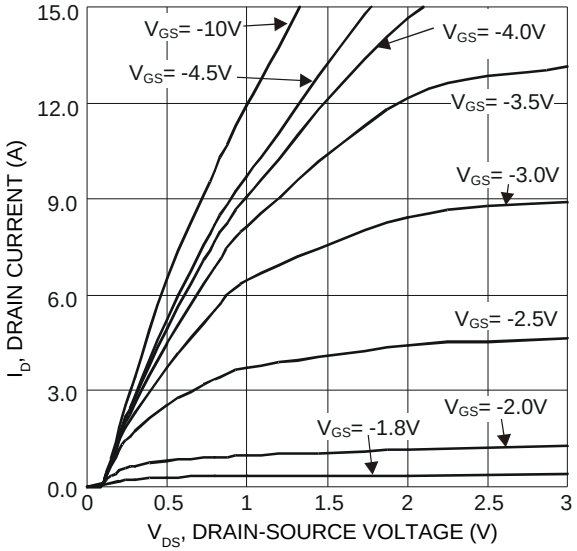


Figure 1. Typical Output Characteristic

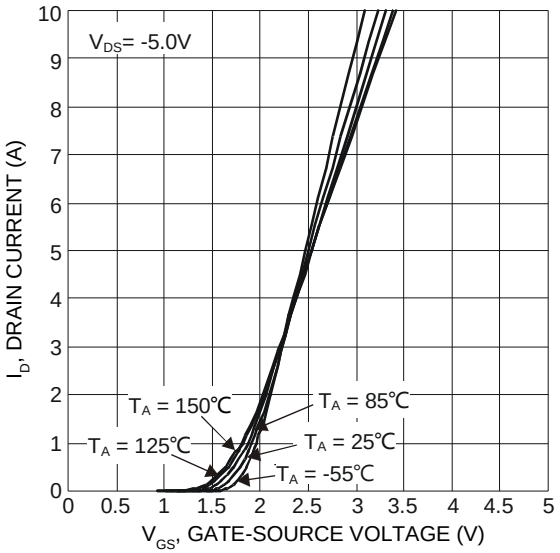


Figure 2. Typical Transfer Characteristic

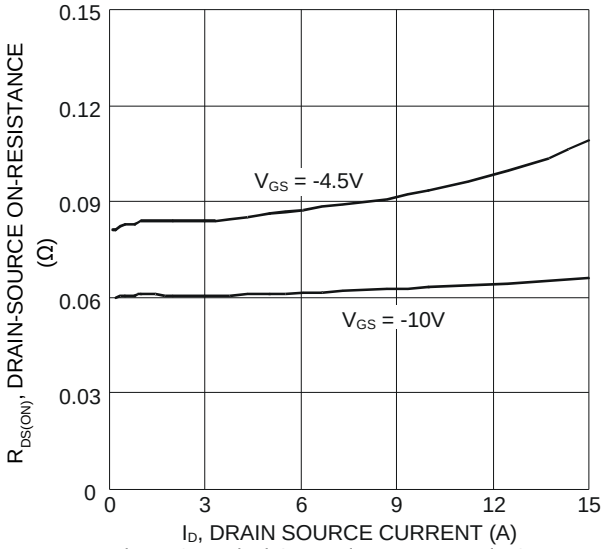


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

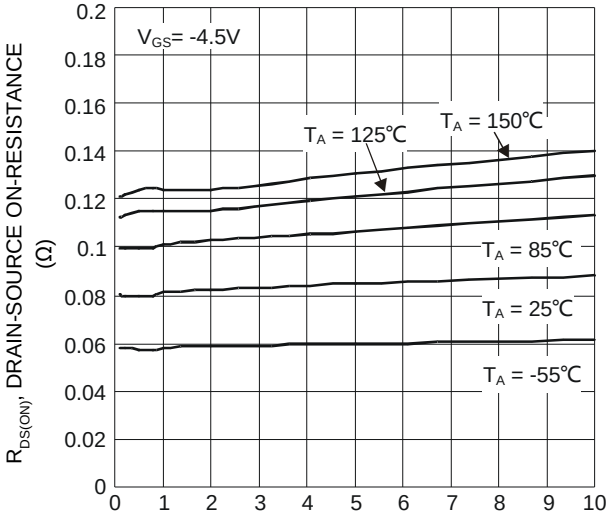


Figure 4. Typical On-Resistance vs. Drain Current and Temperature

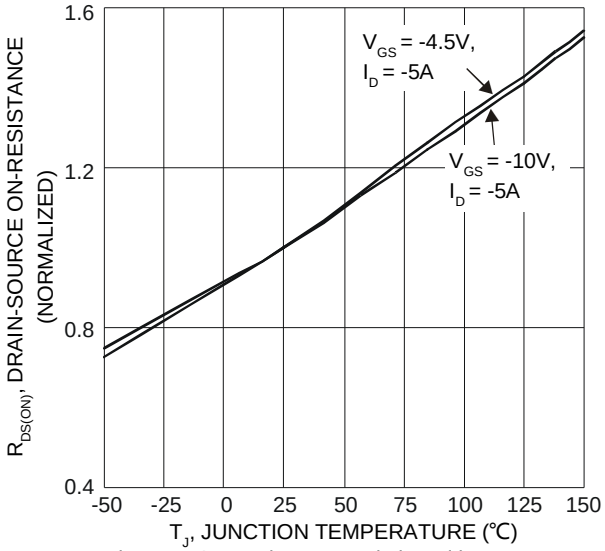


Figure 5. On-Resistance Variation with Temperature

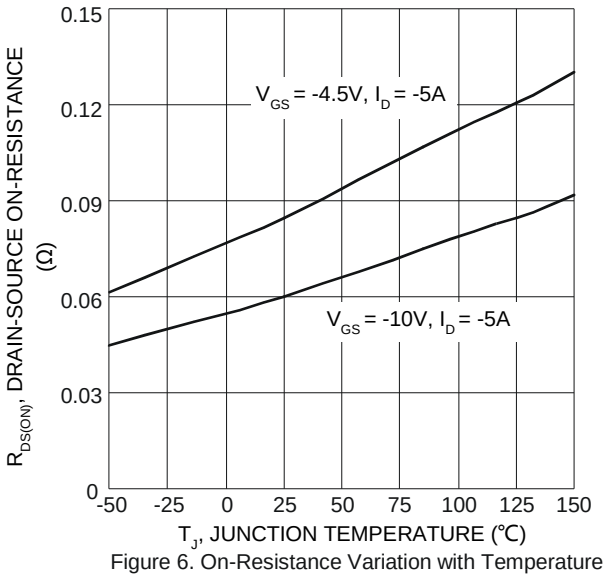


Figure 6. On-Resistance Variation with Temperature

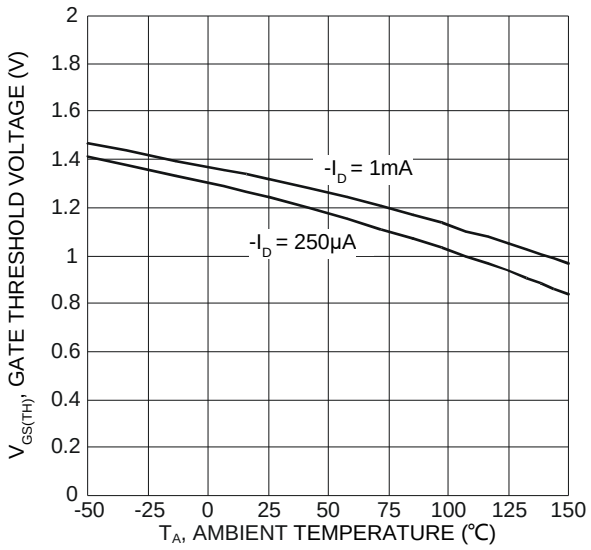


Figure 7. Gate Threshold Variation vs. Ambient Temperature

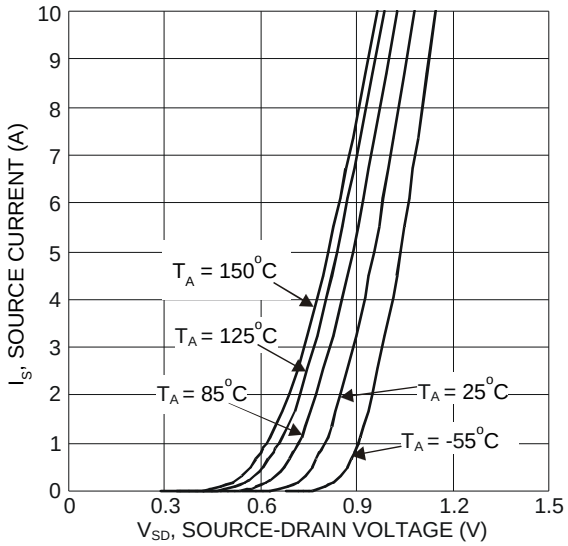


Figure 8. Diode Forward Voltage vs. Current

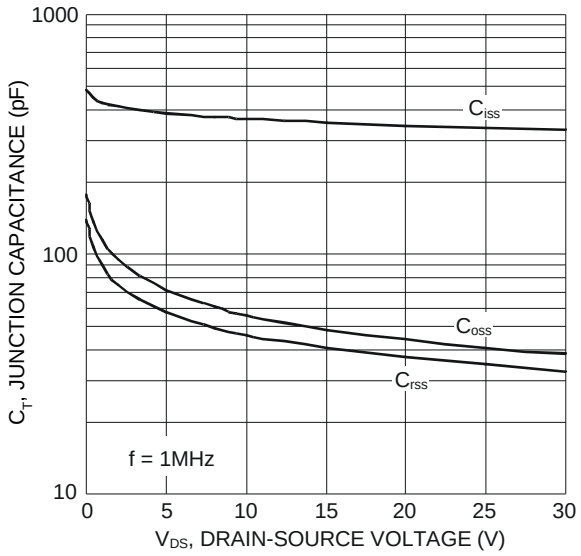


Figure 9. Typical Junction Capacitance

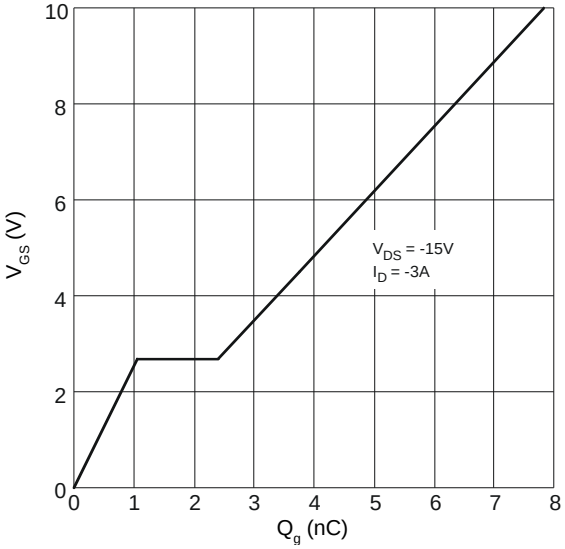


Figure 10. Gate-Charge Characteristics

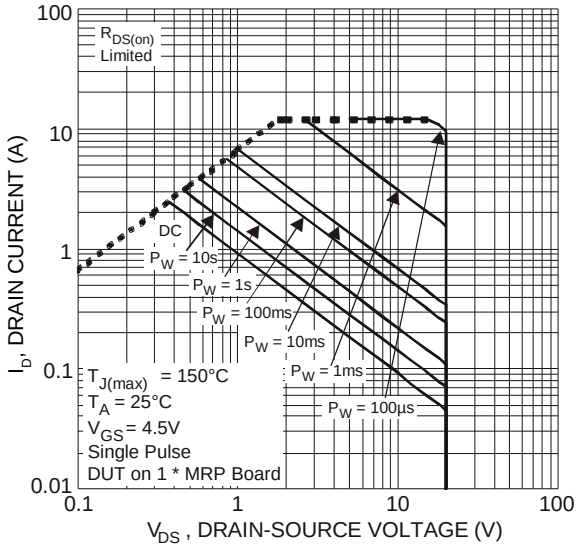


Figure 11. SOA, Safe Operation Area

Electrical Characteristics – SCHOTTKY – D1 (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Reverse Breakdown Voltage (Note 10)	$V_{(BR)R}$	20	35	—	V	I_R = 1mA
Forward Voltage (Note 10)	V_F	— —	— —	0.40 0.47	V	I_F = 0.5A I_F = 1.0A
Reverse Current (Note 10)	I_R	—	30	80	μA	V_R = 20V

Note: 10. Short duration pulse test used to minimize self-heating effect.

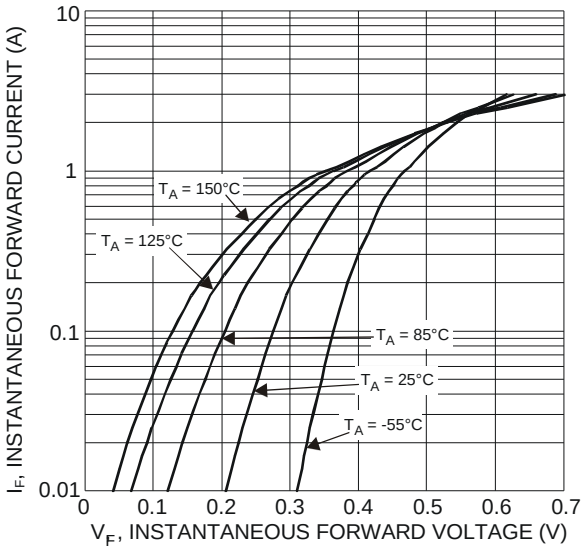


Figure 12. Typical Forward Characteristics

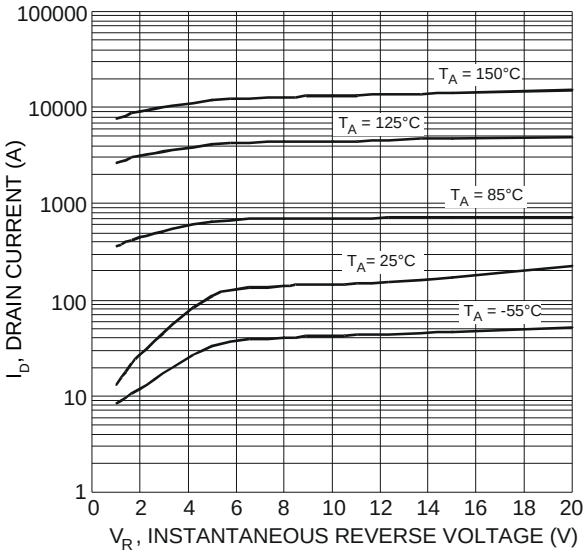
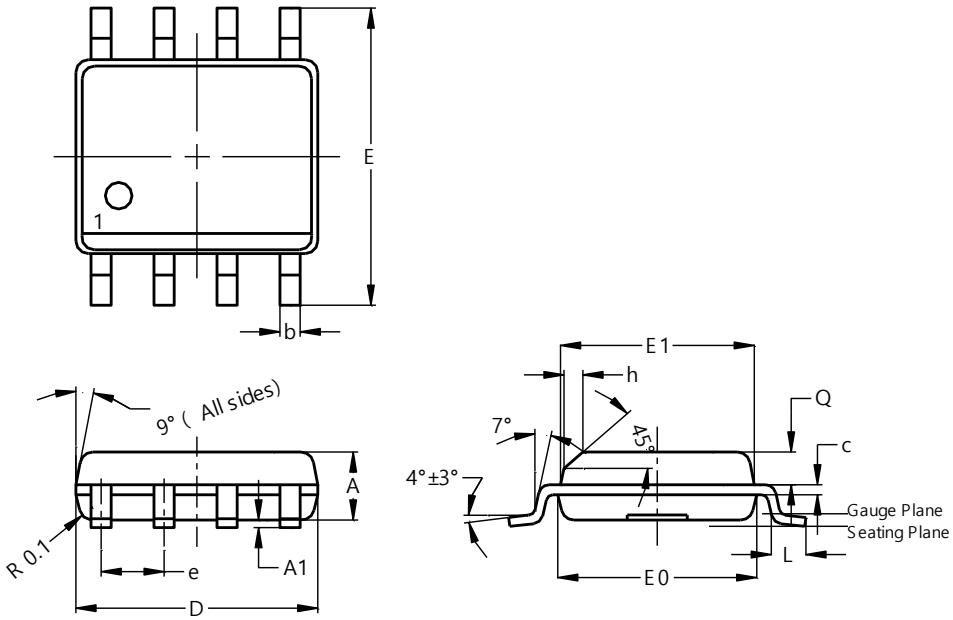


Figure 13. Typical Reverse Characteristics

Package Outline Dimensions

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

SO-8

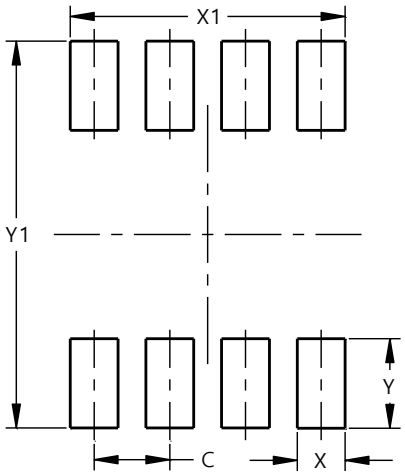


SO-8			
Dim	**Min**	**Max**	**Typ**
A	1.40	1.50	1.45
A1	0.10	0.20	0.15
b	0.30	0.50	0.40
c	0.15	0.25	0.20
D	4.85	4.95	4.90
E	5.90	6.10	6.00
E1	3.80	3.90	3.85
E0	3.85	3.95	3.90
e	--	--	1.27
h	--	--	0.35
L	0.62	0.82	0.72
Q	0.60	0.70	0.65
All Dimensions in mm			

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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