

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**

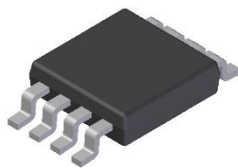
<https://www.diodes.com/products/automotive/automotive-products/>.

- **This part is qualified to JEDEC standards (as references in AEC-Q) for High Reliability.**

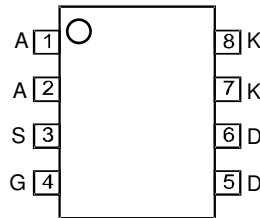
<https://www.diodes.com/quality/product-definitions/>

Mechanical Data

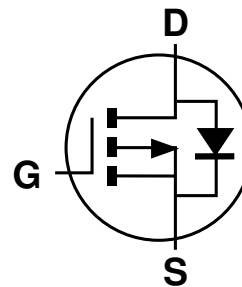
- Package: SO-8
- Package Material: Molded Plastic, “Green” Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe Solderable per MIL-STD-202, Method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



Top View



Top View



Q1 P-Channel MOSFET



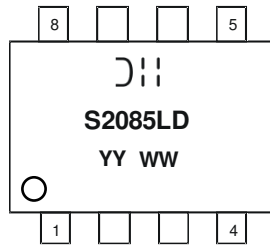
D1 Schottky Diode

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 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	I _D	T _A = +25°C T _A = +70°C	-3.3 -2.7	A
	t < 10s		T _A = +25°C T _A = +70°C	-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	V _{RRM}	20	V
Working Peak Reverse Voltage	V _{RWM}		
DC Blocking Voltage	V _R		
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.)

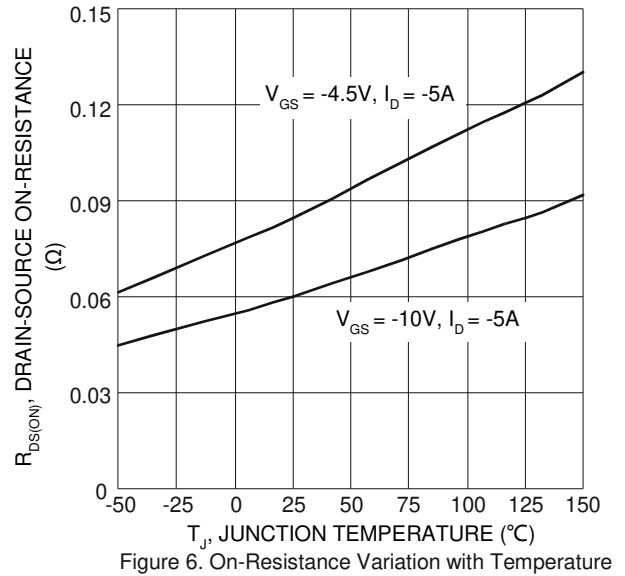
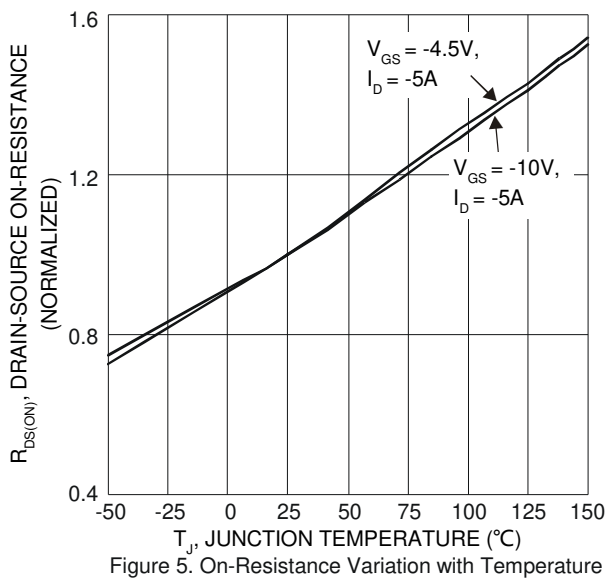
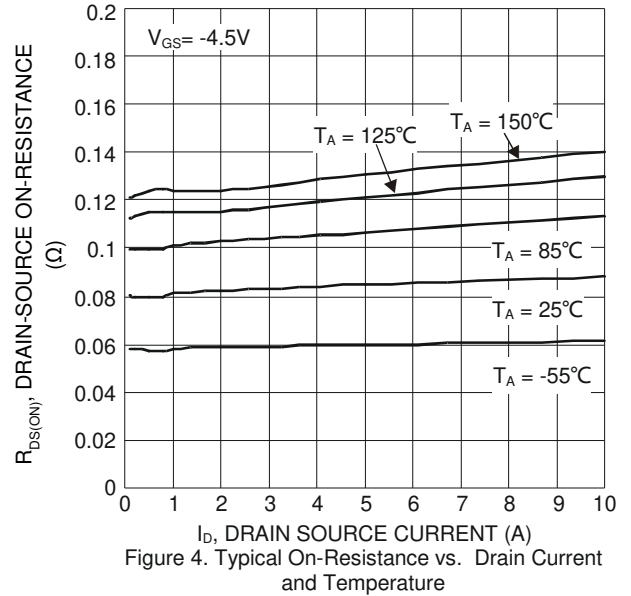
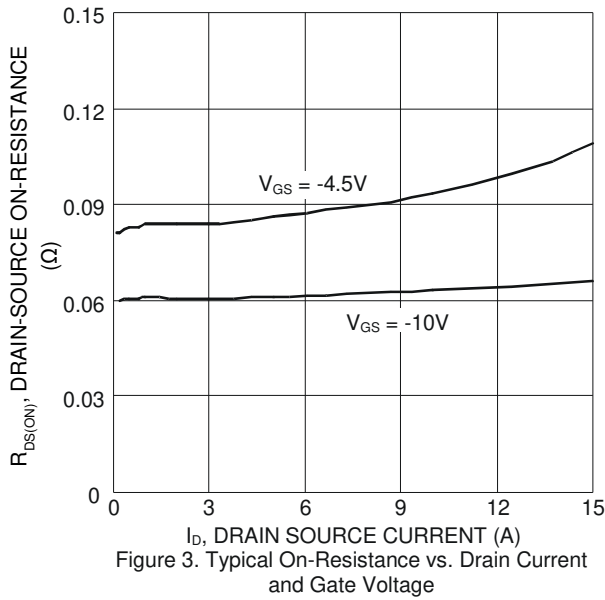
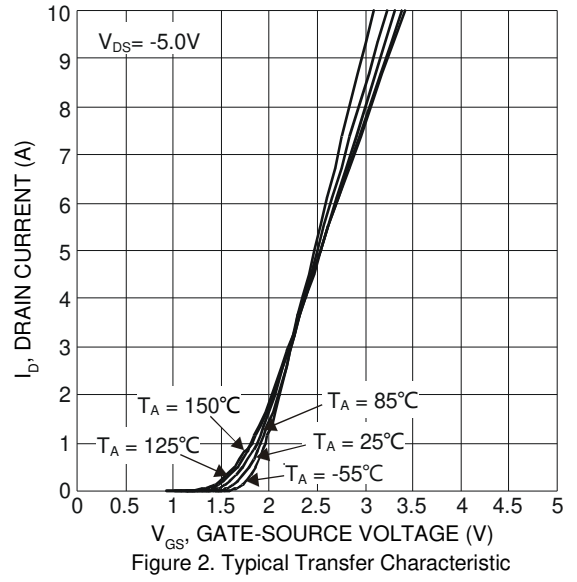
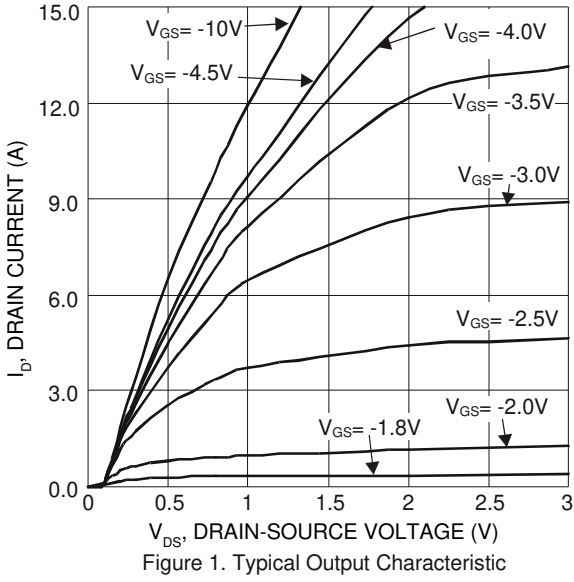
Characteristic	Symbol	Value	Units
Total Power Dissipation (Note 5)	P _D	T _A = +25°C	1.1
		T _A = +70°C	0.7
Thermal Resistance, Junction to Ambient (Note 5)	R _{θJA}	Steady State	108
		t < 10s	65
Total Power Dissipation (Note 6)	P _D	T _A = +25°C	1.8
		T _A = +70°C	1.0
Thermal Resistance, Junction to Ambient (Note 6)	R _{θJA}	Steady State	78
		t < 10s	50
Thermal Resistance, Junction to Case (Note 6)	R _{θJC}	22	°C/W
Operating and Storage Temperature Range	T _J , T _{STG}	-55 to +150	

- 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 1 inch 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.



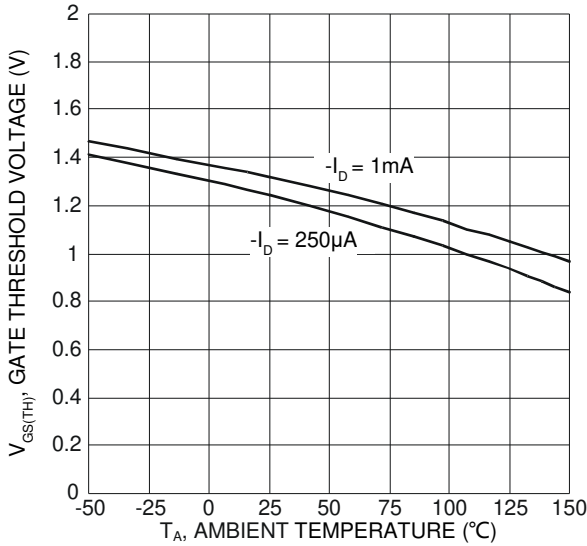


Figure 7. Gate Threshold Variation vs. Ambient Temperature

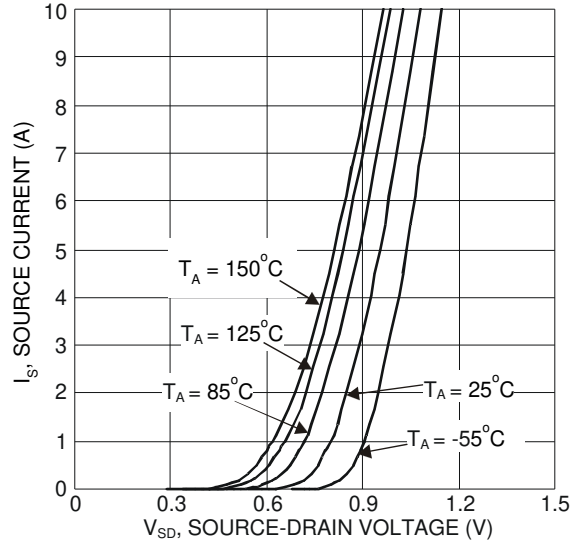


Figure 8. Diode Forward Voltage vs. Current

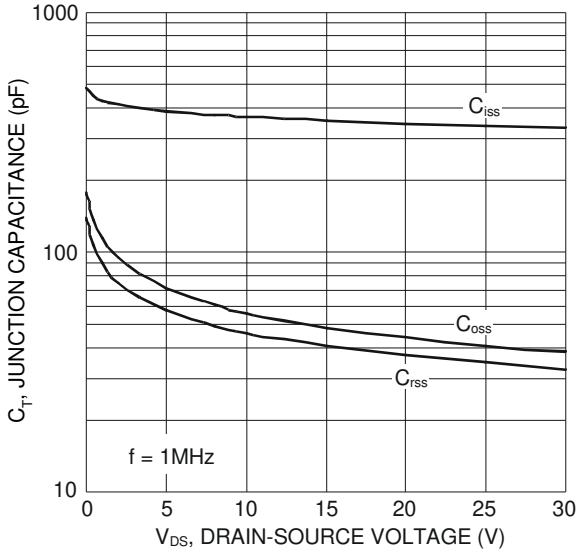


Figure 9. Typical Junction Capacitance

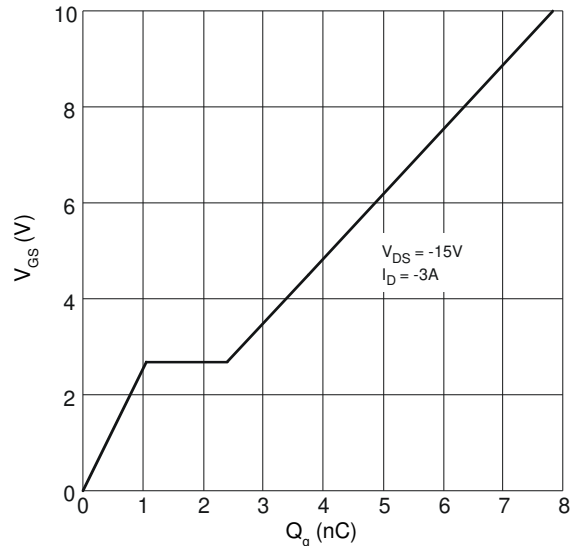


Figure 10. Gate-Charge Characteristics

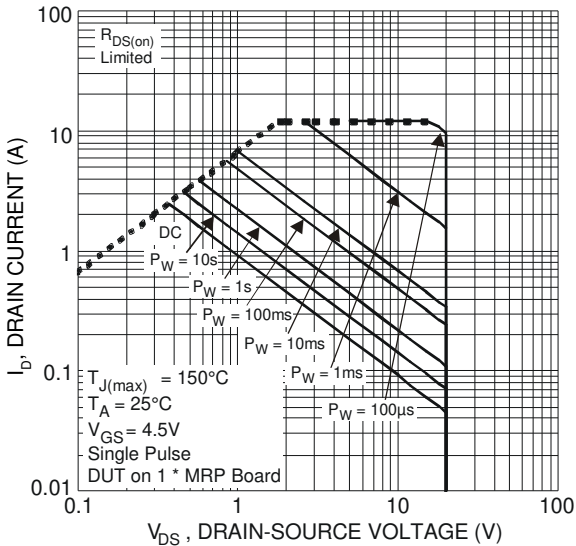


Figure 11. SOA, Safe Operation Area

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.

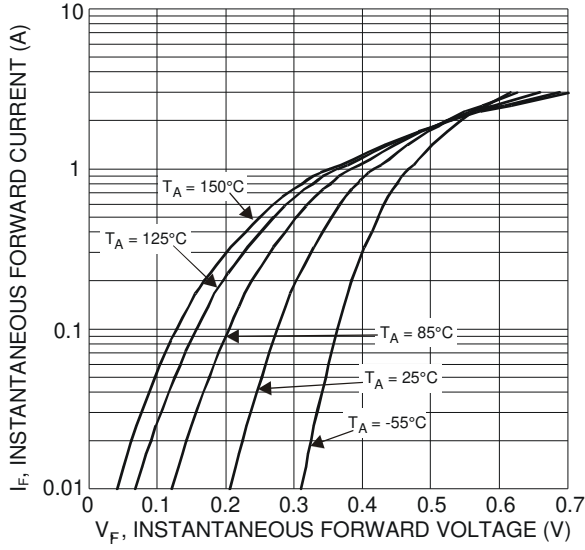


Figure 12. Typical Forward Characteristics

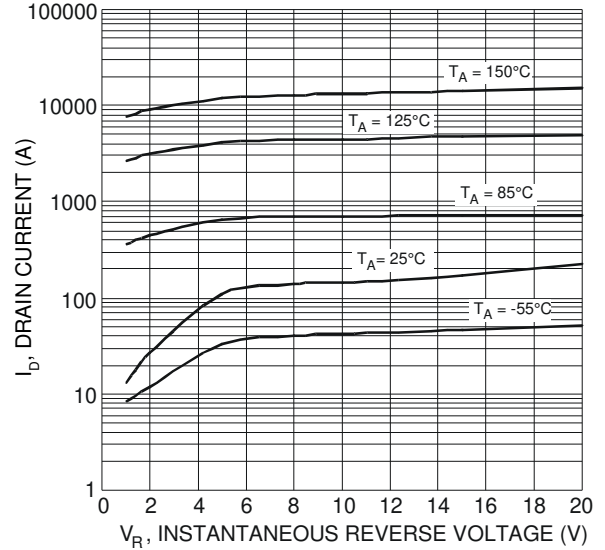
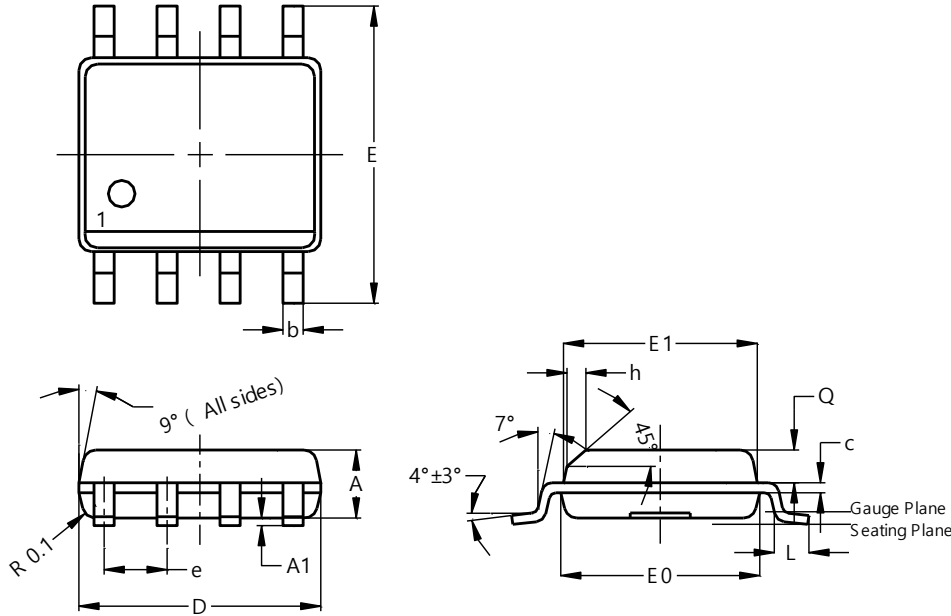


Figure 13. Typical Reverse Characteristics

Package Outline Dimensions

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

SO-8

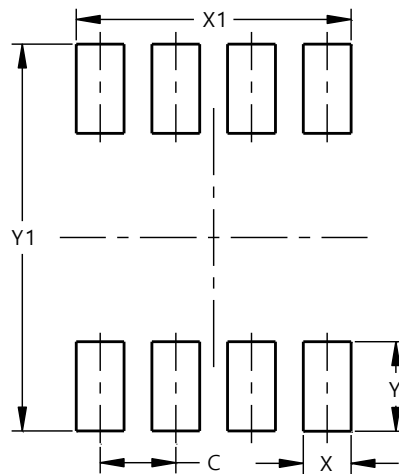


SO-8			
Dim	Min	Max	Typ
A	1.40	1.50	1.45
A1	0.10	0.20	0.15
b	0.30	0.50	0.40
c	0.15	0.25	0.20
D	4.85	4.95	4.90
E	5.90	6.10	6.00
E1	3.80	3.90	3.85
E0	3.85	3.95	3.90
e	--	--	1.27
h	--	--	0.35
L	0.62	0.82	0.72
Q	0.60	0.70	0.65
All Dimensions in mm			

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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