

**P-CHANNEL ENHANCEMENT MODE MOSFET  
 WITH INTEGRATED SCHOTTKY DIODE**
**Product Summary**

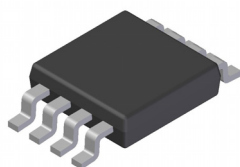
MOSFET		
$V_{(BR)DSS}$	$R_{DS(on)}$ max	$I_D$
-20V	85mΩ @ $V_{GS} = -10V$	-3.3A
	125mΩ @ $V_{GS} = -4.5V$	-2.8A
SCHOTTKY DIODE		
$V_R$	$V_F$ max	$I_O$
20V	400mV @ $I_F = 0.5A$	1.0A
	470mV @ $I_F = 1.0A$	

**Description**

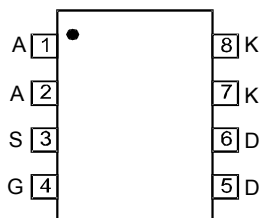
This new generation MOSFET has been designed to minimize the on-state resistance ( $R_{DS(ON)}$ ) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

**Applications**

- DC-DC Converters
- Power Management Functions
- Backlighting



Top View

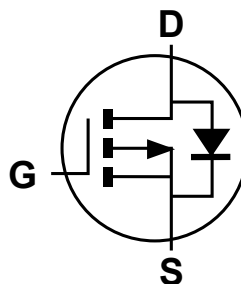

 Top View  
 Internal Schematic

**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)**
- **Qualified to AEC-Q101 Standards for High Reliability**

**Mechanical Data**

- Case: SO-8
- Case 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 Ⓔ3
- Weight: 0.074 grams (approximate)



Q1 P-Channel MOSFET

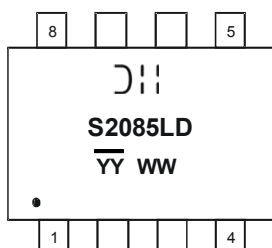


D1 Schottky Diode

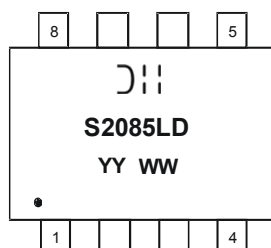
**Ordering Information (Note 4)**

Part Number	Case	Packaging
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) compliant.
  2. See [http://www.diodes.com/quality/lead\\_free.html](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. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

**Marking Information**


Chengdu A/T Site



Shanghai A/T Site

JII = Manufacturer's Marking  
 S2085LD = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY or YY = Year (ex: 13 = 2013)  
 WW = Week (01 - 53)  
 YY = Date Code Marking for SAT (Shanghai Assembly/ Test site)  
 YY = Date Code Marking for CAT (Chengdu Assembly/ Test site)

**Maximum Ratings – P-CHANNEL MOSFET – Q1** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V <sub>DSS</sub>	-20	V
Gate-Source Voltage			V <sub>GSS</sub>	±20	V
Continuous Drain Current (Note 6) V <sub>GS</sub> = 10V	Steady State	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	-3.3 -2.7	A
	t<10s	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	-4.3 -3.4	A
Maximum Body Diode Forward Current (Note 6)			I <sub>S</sub>	-1.5	A
Pulsed Drain Current (10µs pulse, duty cycle = 1%)			I <sub>DM</sub>	-11.2	A
Avalanche Current (Notes 7) L = 5mH			I <sub>AR</sub>	-5	A
Avalanche Energy (Notes 7) L = 5mH			E <sub>AR</sub>	50	mJ

**Maximum Ratings – SCHOTTKY – D1** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Peak Repetitive Reverse Voltage	V <sub>RRM</sub>	20	V
Working Peak Reverse Voltage	V <sub>RWM</sub>		
DC Blocking Voltage	V <sub>R</sub>		
Average Rectified Output Current (Note 7, t<10s)	I <sub>O</sub>	1	A
Peak Repetitive Forward Current (Note 7, t<10s)	I <sub>FRM</sub>	2	A
Non-Repetitive Peak Forward Surge Current (Note 7, t<10s) Single half sine-wave superimposed on rated load	I <sub>FSM</sub>	20	A

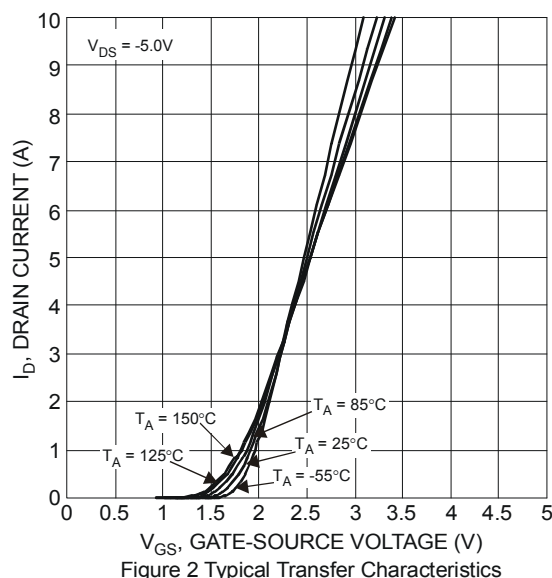
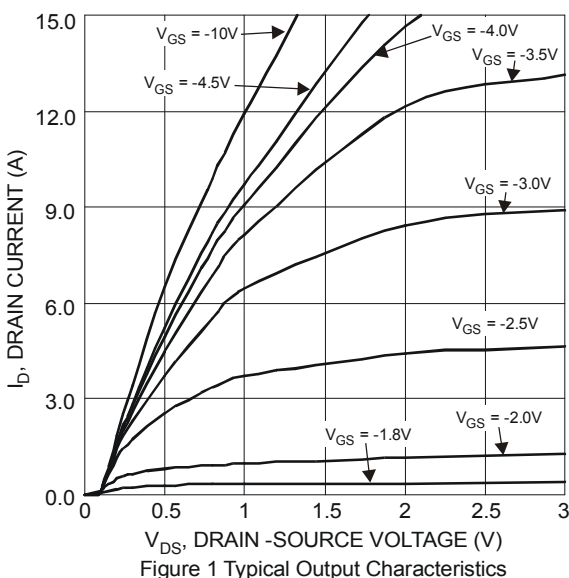
**Thermal Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)	T <sub>A</sub> = +25°C	P <sub>D</sub>	1.1	W
	T <sub>A</sub> = +70°C		1.8	
Thermal Resistance, Junction to Ambient (Note 5)	Steady state	R <sub>θJA</sub>	108	°C/W
	t<10s		65	
Total Power Dissipation (Note 6)	T <sub>A</sub> = +25°C	P <sub>D</sub>	1.8	W
	T <sub>A</sub> = +70°C		2.3	
Thermal Resistance, Junction to Ambient (Note 6)	Steady state	R <sub>θJA</sub>	78	°C/W
	t<10s		50	
Thermal Resistance, Junction to Case (Note 6)		R <sub>θJC</sub>	22	
Operating and Storage Temperature Range		T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

**Electrical Characteristics P-Channel Q1** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 8)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	-20	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	-1	μA	V <sub>DS</sub> = -20V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±100	nA	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 8)</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	-0.5	-1.5	-2.2	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	—	70	85	mΩ	V <sub>GS</sub> = -10V, I <sub>D</sub> = -3.05A
		—	100	125		V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -1.50A
Diode Forward Voltage	V <sub>SD</sub>	—	-0.8	-1.0	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = -1.0A
<b>DYNAMIC CHARACTERISTICS (Note 9)</b>						
Input Capacitance	C <sub>iss</sub>	—	353	—	pF	V <sub>DS</sub> = -15V, V <sub>GS</sub> = 0V f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	49	—		
Reverse Transfer Capacitance	C <sub>rss</sub>	—	41	—		
Gate Resistance	R <sub>G</sub>	—	6.2	—	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1.0MHz
Total Gate Charge (V <sub>GS</sub> = -4.5V)	Q <sub>g</sub>	—	3.7	—	nC	V <sub>DS</sub> = -15V, I <sub>D</sub> = -3A
Total Gate Charge (V <sub>GS</sub> = -10V)	Q <sub>g</sub>	—	7.8	—		
Gate-Source Charge	Q <sub>gs</sub>	—	1.1	—		
Gate-Drain Charge	Q <sub>gd</sub>	—	1.3	—		
Turn-On Delay Time	t <sub>D(on)</sub>	—	3.3	—	nS	V <sub>DS</sub> = -15V, R <sub>L</sub> = 15Ω V <sub>GS</sub> = -10V, R <sub>G</sub> = 6Ω
Turn-On Rise Time	t <sub>r</sub>	—	3.0	—		
Turn-Off Delay Time	t <sub>D(off)</sub>	—	14	—		
Turn-Off Fall Time	t <sub>f</sub>	—	6.8	—		
Body Diode Reverse Recovery Time	t <sub>rr</sub>	—	33	—	nS	I <sub>S</sub> = -3.05A, dI/dt = 100A/μs
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>	—	46	—	nC	I <sub>S</sub> = -3.05A, dI/dt = 100A/μs

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
  - Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
  - I<sub>AS</sub> and E<sub>AS</sub> rating are based on low frequency and duty cycles to keep T<sub>J</sub> = +25°C
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to product testing.



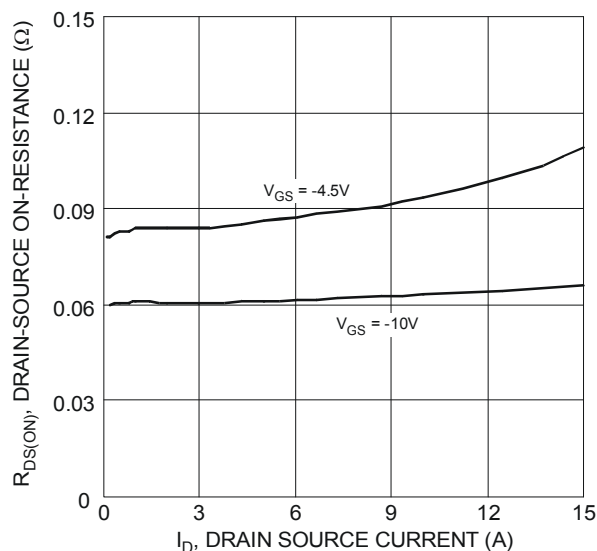


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

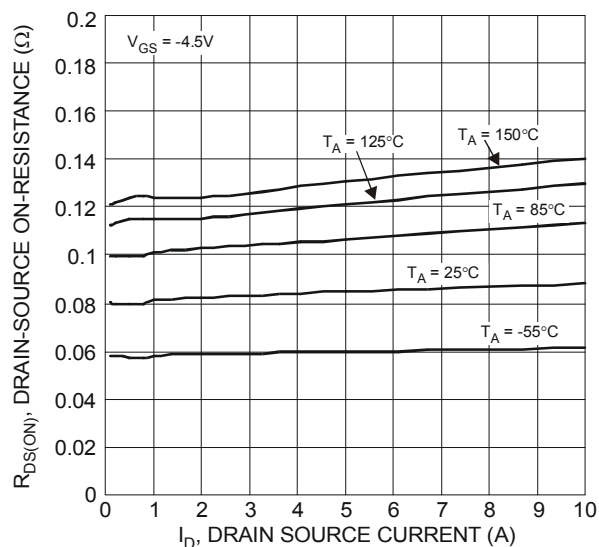


Figure 4 Typical On-Resistance vs. Drain Current and Temperature

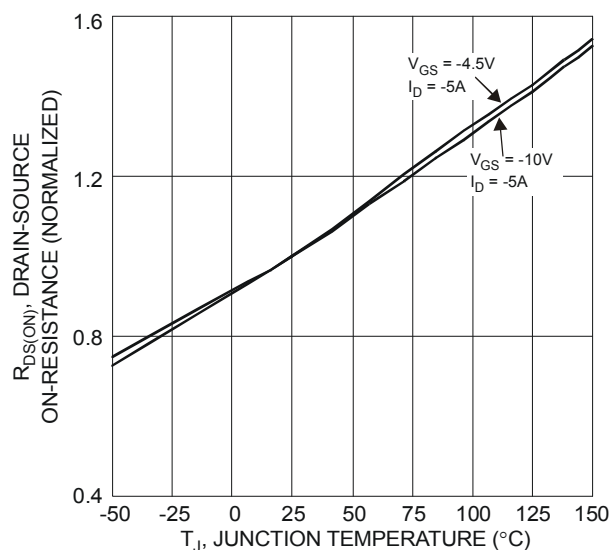


Figure 5 On-Resistance Variation with Temperature

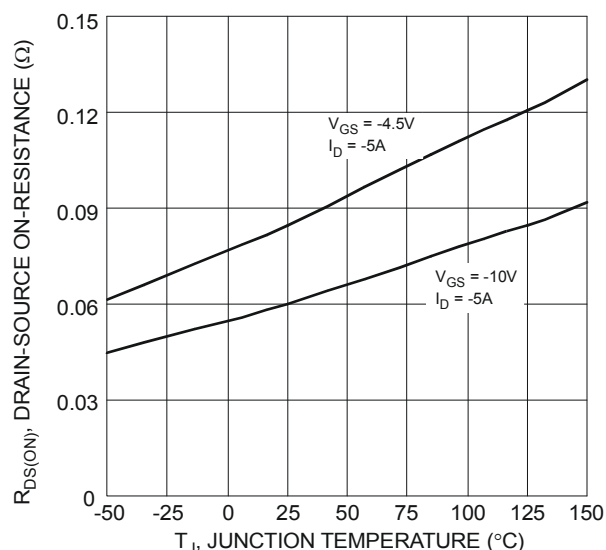


Figure 6 On-Resistance Variation with Temperature

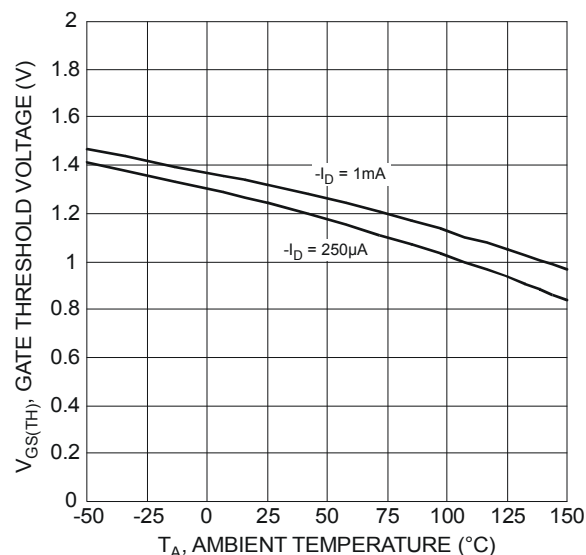


Figure 7 Gate Threshold Variation vs. Ambient Temperature

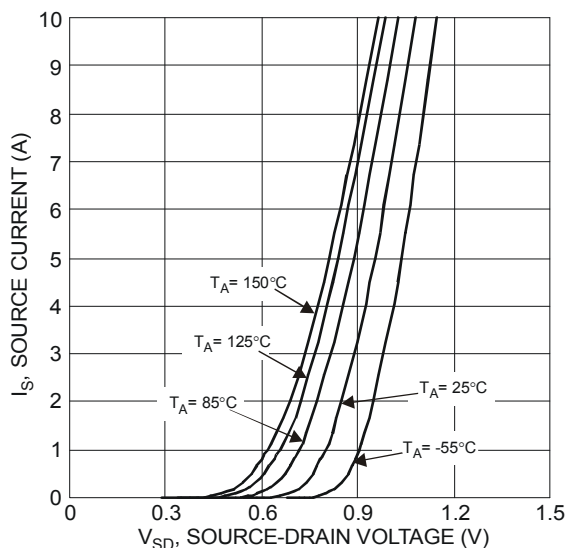


Figure 8 Diode Forward Voltage vs. Current

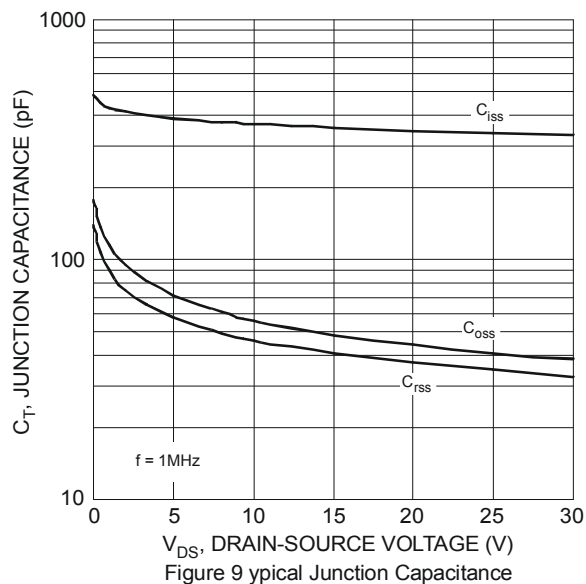


Figure 9 typical Junction Capacitance

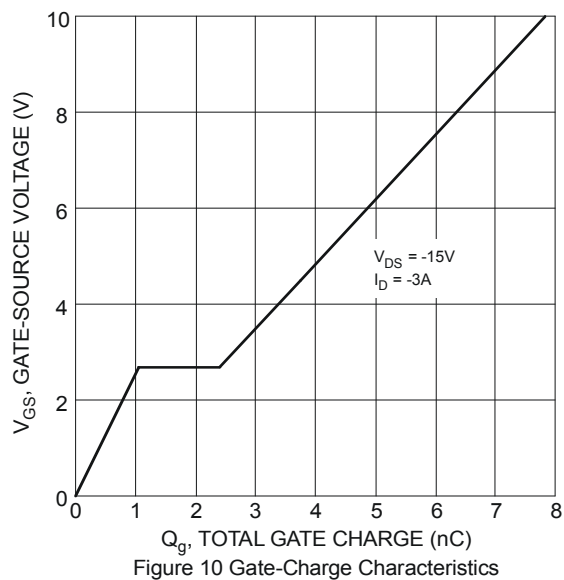


Figure 10 Gate-Charge Characteristics

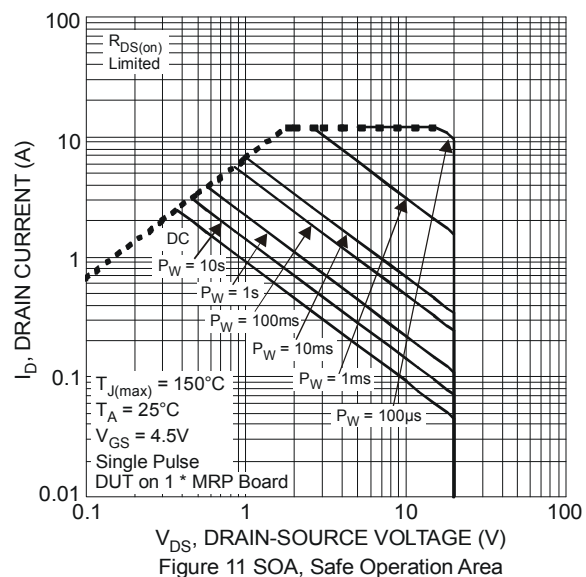


Figure 11 SOA, Safe Operation Area

**Electrical Characteristics – SCHOTTKY – D1** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Reverse Breakdown Voltage (Note 8)	V <sub>(BR)R</sub>	20	35	—	V	I <sub>R</sub> = 1mA
Forward Voltage (Note 8)	V <sub>F</sub>	—	—	0.40 0.47	V	I <sub>F</sub> = 0.5A I <sub>F</sub> = 1.0A
Reverse Current (Note 8)	I <sub>R</sub>	—	30	80	μA	V <sub>R</sub> = 20V

Notes: 8. Short duration pulse test used to minimize self-heating effect.

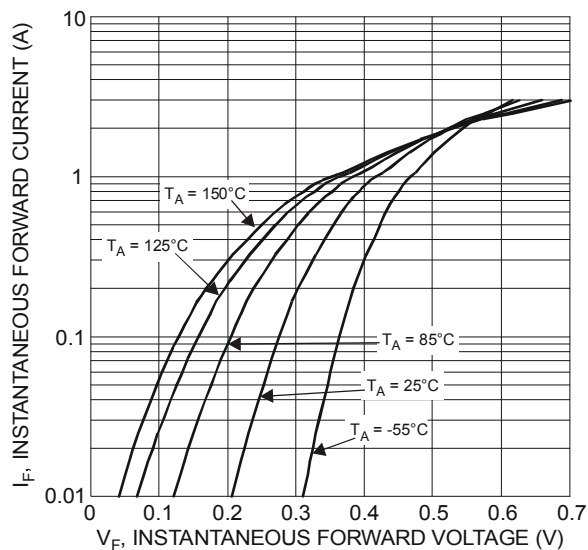


Figure 12 Typical Forward Characteristics

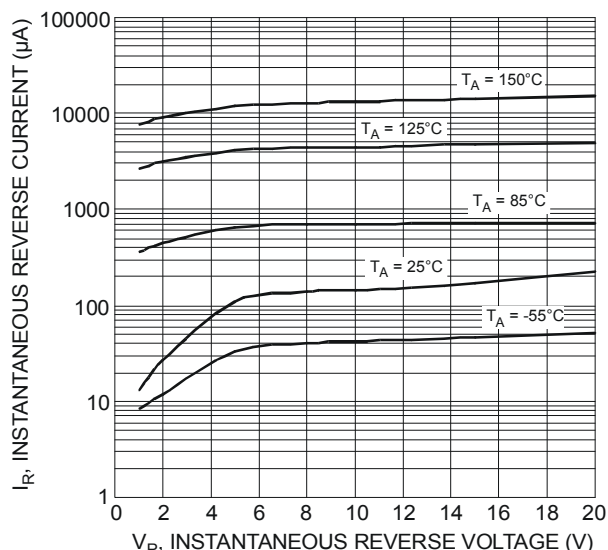
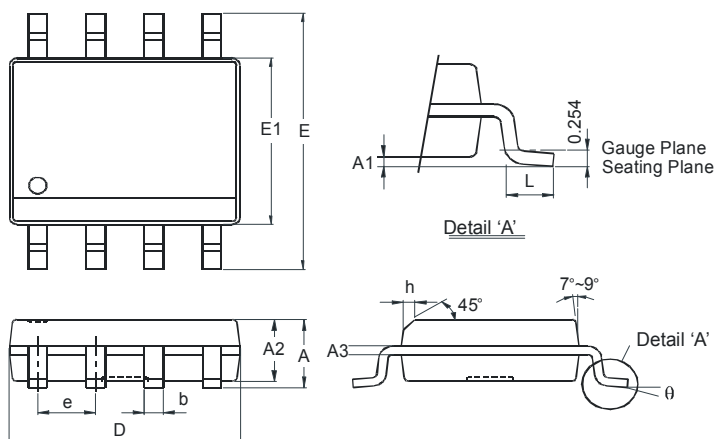


Figure 13 Typical Reverse Characteristics

**Package Outline Dimensions**

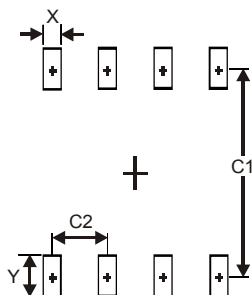
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



SO-8		
Dim	Min	Max
A	-	1.75
A1	0.10	0.20
A2	1.30	1.50
A3	0.15	0.25
b	0.3	0.5
D	4.85	4.95
E	5.90	6.10
E1	3.85	3.95
e	1.27 Typ	
h	-	0.35
L	0.62	0.82
θ	0°	8°
All Dimensions in mm		

## Suggested Pad Layout

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



Dimensions	Value (in mm)
X	0.60
Y	1.55
C1	5.4
C2	1.27

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