

**60V DUAL N-CHANNEL SELF PROTECTED ENHANCEMENT MODE
IntelliFET MOSFET**

Product Summary

- Continuous Drain-Source Voltage: 60V
- On-State Resistance: 100mΩ
- Nominal Load Current ($V_{IN} = 5V$): 2.8A
- Clamping Energy: 210mJ

Description

The ZXMS6006DN8Q is a dual self-protected low-side IntelliFET[®] MOSFET with logic level input. It integrates overtemperature, overcurrent, overvoltage (active clamp), and ESD protected logic level functionality. The ZXMS6006DN8Q is ideal as a general-purpose switch driven from 3.3V or 5V microcontrollers in harsh environments where standard MOSFETs are not rugged enough.

Applications

- Lamp drivers
- Motor drivers
- Relay drivers
- Solenoid drivers

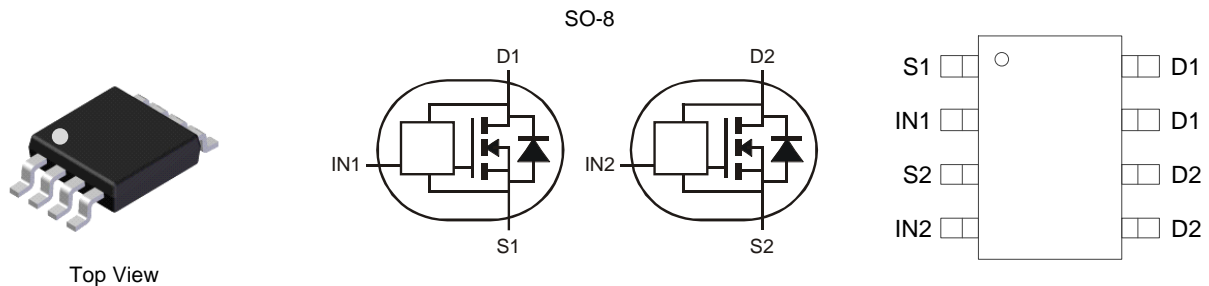
Features and Benefits

- Low Input Current
- Logic Level Input (3.3V and 5V)
- Short Circuit Protection with Auto Restart
- Overvoltage Protection (Active Clamp)
- Thermal Shutdown with Auto Restart
- Overcurrent Protection
- Input Protection (ESD)
- High Continuous Current Rating
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **The ZXMS6006DN8Q is suitable for automotive applications requiring specific change control; this part is AEC-Q101 qualified, PPAP capable, and manufactured in IATF 16949 certified facilities.**

<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
- Terminals: Matte Tin Finish
- Weight: 79.1mg (Approximate)

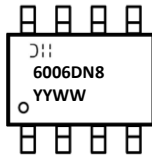


Ordering Information (Note 4)

Orderable Part Number	Marking	Reel Size (inches)	Tape Width (mm)	Package	Packing	
					Quantity	Carrier
ZXMS6006DN8Q-13	6006DN8	13	12	SO-8	2,500	Reel

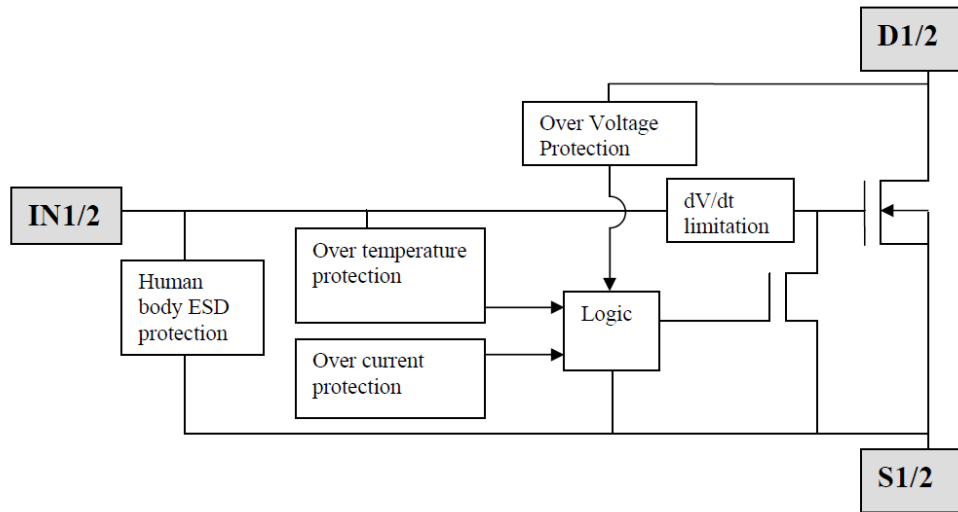
- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
 2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 3. Halogen- 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



D|| = Manufacturer's Marking
 6006DN8 = Product Type Marking Code
 YYWW = Date Code Marking
 YY or YY: Year
 WW or WW: Week: 01-52;
 52 Represents 52 and 53 Week

Functional Block Diagram



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

Characteristic	Symbol	Value	Units
Continuous Drain-Source Voltage	V _{DS}	60	V
Drain-Source Voltage For Short Circuit Protection	V _{DS(SC)}	16	V
Continuous Input Voltage	V _{IN}	-0.5 to +6	V
Continuous Input Current @ -0.2V ≤ V _{IN} ≤ 6V	I _{IN}	No limit I _{IN} ≤ 2	mA
Continuous Input Current @ V _{IN} < -0.2V or V _{IN} > 6V			
Pulsed Drain Current @ V _{IN} = 3.3V (Note 7)	I _{DM}	11	A
Pulsed Drain Current @ V _{IN} = 5V (Note 7)	I _{DM}	13	A
Continuous Source Current (Body Diode) (Note 5)	I _S	2	A
Pulsed Source Current (Body Diode)	I _{SM}	12	A
Unclamped Single Pulse Inductive Energy, T _J = +25°C, I _D = 0.5A, V _{DD} = 24V	E _{AS}	210	mJ
Electrostatic Discharge (Human Body Model)	V _{ESD}	4000	V
Charged Device Model	V _{CDM}	1000	V

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

Characteristic	Symbol	Value	Units
Power Dissipation at T _A = +25°C (Notes 5 & 8)	P _D	1.16	W
Linear Derating Factor		9.28	mW/°C
Power Dissipation at T _A = +25°C (Notes 5 & 9)	P _D	1.67	W
Linear Derating Factor		13.3	mW/°C
Power Dissipation at T _A = +25°C (Notes 6 & 8)	P _D	2.13	W
Linear Derating Factor		17	mW/°C
Thermal Resistance, Junction to Ambient (Notes 5 & 8)	R _{θJA}	108	°C/W
Thermal Resistance, Junction to Ambient (Notes 5 & 9)	R _{θJA}	93.5	°C/W
Thermal Resistance, Junction to Case (Notes 6 & 8)	R _{θJC}	15.44	°C/W
Thermal Resistance, Junction to Case (Note 10)	R _{θJC}	6.66	°C/W
Operating Temperature Range	T _J	-40 to +150	°C
Storage Temperature Range	T _{STG}	-55 to +150	°C

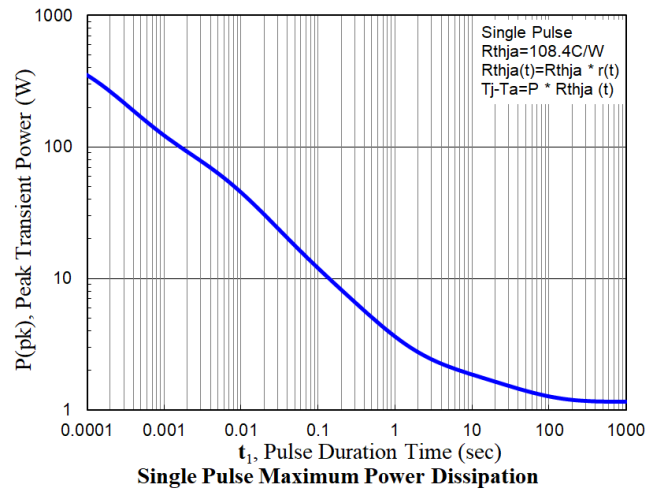
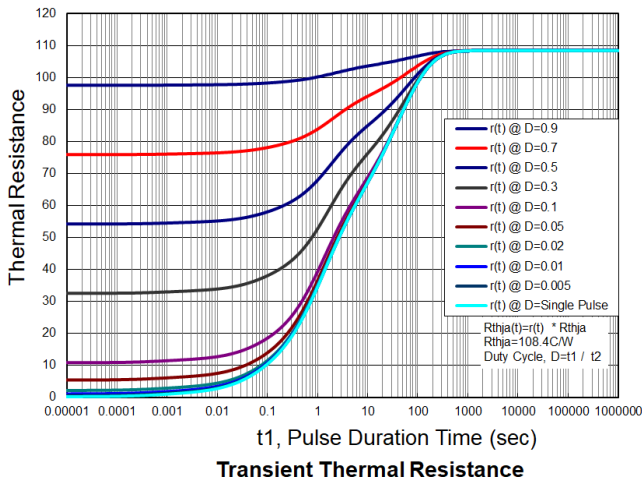
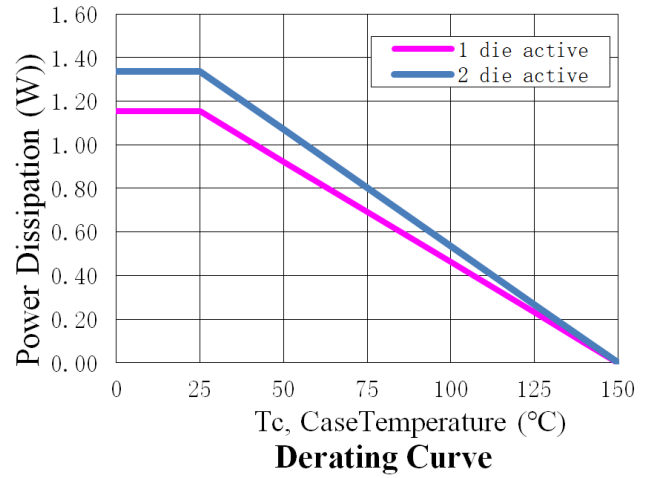
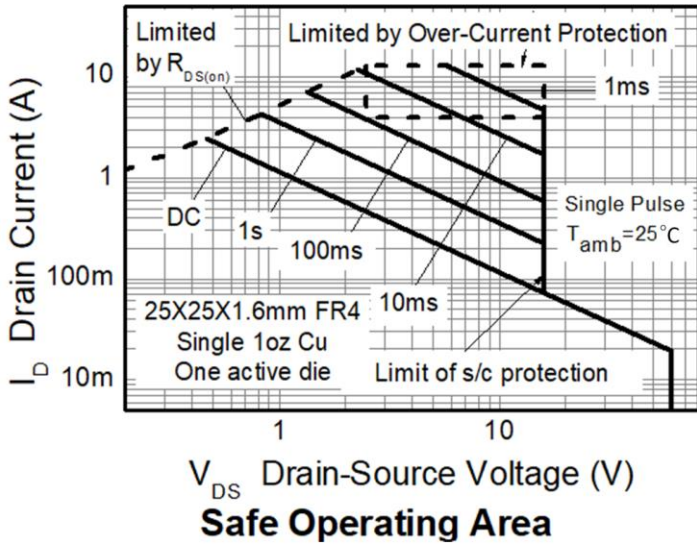
Recommended Operating Conditions

The ZXMS6006DN8Q is optimized for use with μC operating from 3.3V and 5V supplies.

Characteristic	Symbol	Min	Max	Unit
Input Voltage Range	V _{IN}	0	5.5	V
Ambient Temperature Range	T _A	-40	+125	°C
High Level Input Voltage for MOSFET to be on	V _{IH}	3	5.5	V
Low Level Input Voltage for MOSFET to be off	V _{IL}	0	0.7	V
Peripheral Supply Voltage (voltage to which load is referred)	V _P	0	16	V

- Notes:
- For a dual device surface mounted on a 25mm x 25mm single sided 1oz weight copper split down the middle on 1.6mm FR4 board, in still air conditions.
 - For a dual device surface mounted on FR4 PCB measured at t ≤ 10sec
 - Repetitive rating 25mm x 25mm FR4 PCB, D = 0.02, Pulse width = 300μs – pulse width limited by junction temperature. Refer to transient thermal impedance graph.
 - For a dual device with one active die.
 - For a dual device with 2 active die running at equal power.
 - Thermal resistance from junction to the mounting surface of the drain pin.

Thermal Characteristics

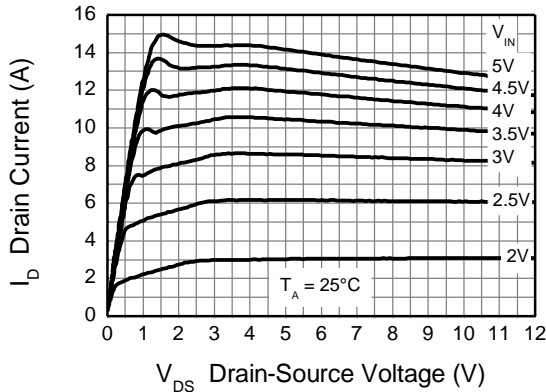


Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

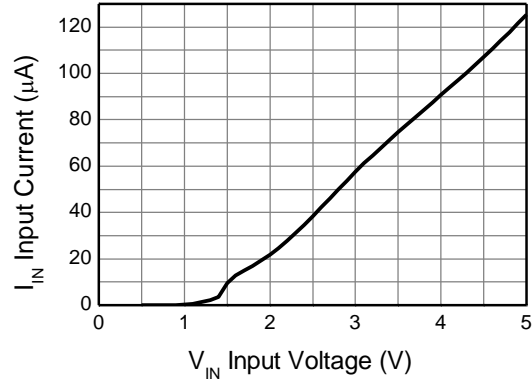
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Static Characteristics						
Drain-Source Clamp Voltage	V _{DS(AZ)}	60	65	70	V	I _D = 10mA
Off State Drain Current	I _{DSS}	—	—	1	μA	V _{DS} = 12V, V _{IN} = 0V
		—	—	2		V _{DS} = 36V, V _{IN} = 0V
Input Threshold Voltage	V _{IN(th)}	0.7	1	1.5	V	V _{DS} = V _{GS} , I _D = 1mA
Input Current	I _{IN}	—	60	100	μA	V _{IN} = +3V
		—	120	200		V _{IN} = +5V
Input Current while Over Temperature Active	-	—	—	400	μA	V _{IN} = +5V
Static Drain-Source On-State Resistance	R _{DS(on)}	—	85	125	mΩ	V _{IN} = +3V, I _D = 1A
		—	75	100		V _{IN} = +5V, I _D = 1A
Continuous Drain Current (Notes 5 & 9)	I _D	2.0	—	—	A	V _{IN} = 3V; T _A = +25°C
		2.2	—	—		V _{IN} = 5V; T _A = +25°C
Continuous Drain Current (Notes 5 & 8)		2.6	—	—		V _{IN} = 3V; T _A = +25°C
		2.8	—	—		V _{IN} = 5V; T _A = +25°C
Current Limit (Note 11)	I _{D(LIM)}	4	8	—	A	V _{IN} = +3V
		6	13	—		V _{IN} = +5V
Dynamic Characteristics						
Turn On Delay Time	t _{d(on)}	—	8.6	—	μs	V _{DD} = 12V, I _D = 1A, V _{GS} = 5V
Rise Time	t _r	—	18	—	μs	
Turn Off Delay Time	t _{d(off)}	—	34	—	μs	
Fall Time	t _f	—	15	—	μs	
Overtemperature Protection						
Thermal Overload Trip Temperature (Note 12)	T _{JT}	+150	+175	—	°C	—
Thermal Hysteresis (Note 12)	f _r	—	+10	—	°C	—

- Notes: 11. The drain current is restricted only when the device is in saturation (see graph 'typical output characteristic'). This allows the device to be used in the fully on state without interference from the current limit. The device is fully protected at all drain currents, as the low power dissipation generated outside saturation makes current limit unnecessary.
12. Overtemperature protection is designed to prevent device destruction under fault conditions. Fault conditions are considered as "outside" normal operating range, so this part is not designed to withstand over-temperature for extended periods..

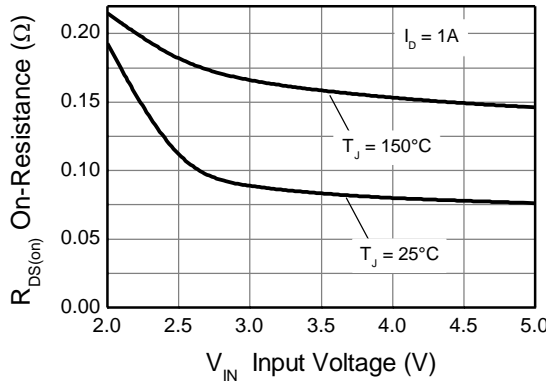
Typical Characteristics



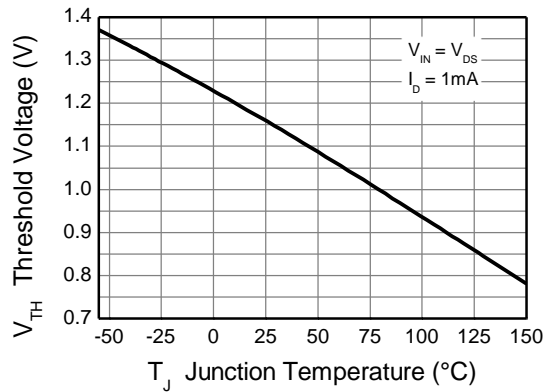
Typical Output Characteristic



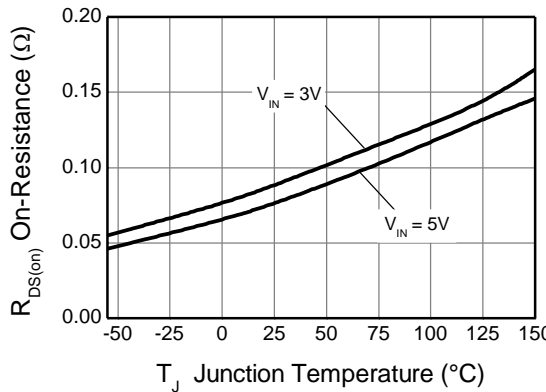
Input Current vs Input Voltage



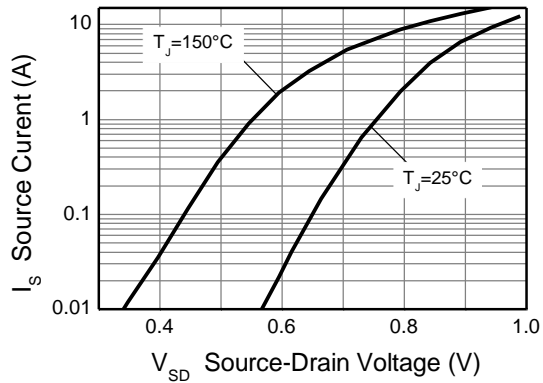
On-Resistance vs Input Voltage



Threshold Voltage vs Temperature

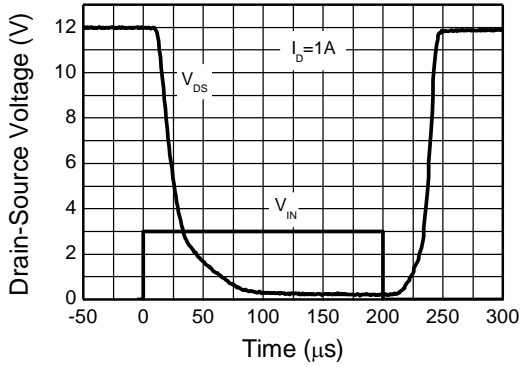


On-Resistance vs Temperature

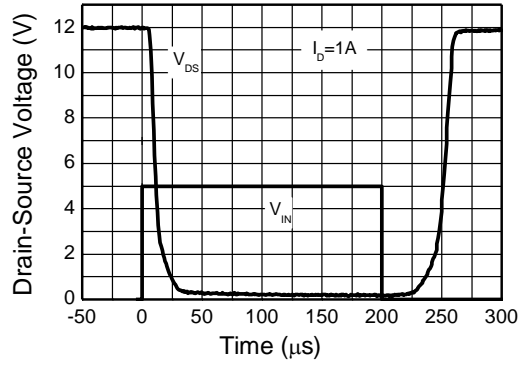


Reverse Diode Characteristic

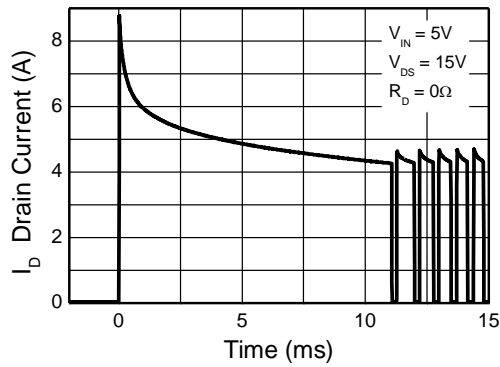
Typical Characteristics (continued)



Switching Speed



Switching Speed

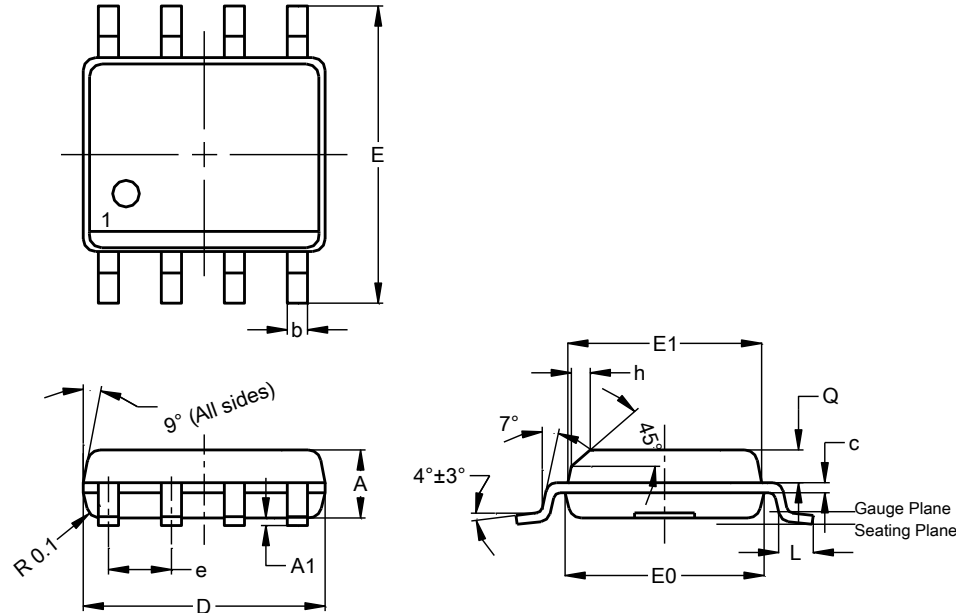


Typical Short Circuit Protection

Package Outline Dimensions

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

SO-8



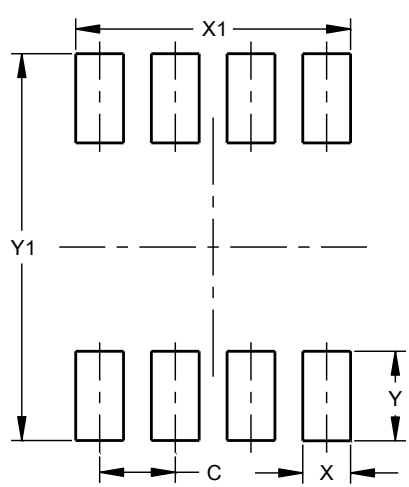
SO-8			
Dim	Min	Max	Typ
A	1.40	1.50	1.45
A1	0.10	0.20	0.15
b	0.30	0.50	0.40
c	0.15	0.25	0.20
D	4.85	4.95	4.90
E	5.90	6.10	6.00
E1	3.80	3.90	3.85
E0	3.85	3.95	3.90
e	--	--	1.27
h	--	--	0.35
L	0.62	0.82	0.72
Q	0.60	0.70	0.65

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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