175°C 60V DUAL P-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

BV_{DSS}	$R_{DS(ON)}$ Max	I_D $T_A = +25°C$
-60V	48mΩ @ V_{GS} = -10V	-5.2A
	60mΩ @ V_{GS} = -4.5V	-4.7A

Description and Applications

This MOSFET is designed to meet the stringent requirements of Automotive applications. It is qualified to AEC-Q101, supported by a PPAP and is ideal for use in:

- Engine Management Systems
- Body Control Electronics
- DC-DC Converters

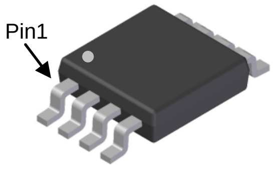
Features

- Rated to +175°C – ideal for high ambient temperature environments
- 100% Unclamped Inductive Switching – ensures more reliable and robust end application
- Low $R_{DS(ON)}$ – minimises power losses
- Low Qg – minimises switching losses
- **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**
- **PPAP Capable (Note 4)**

Mechanical Data

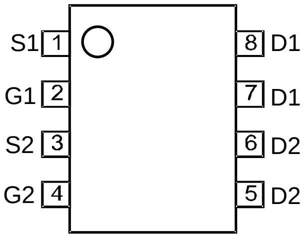
- Case: SO-8
- Case Material: Molded Plastic, “Green” Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe Solderable per MIL-STD-202, Method 208 ⓔ3
- Weight: 0.076 grams (Approximate)

SO-8

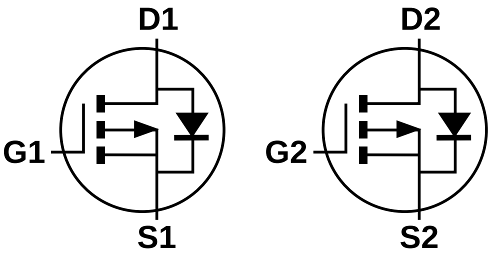


Top View

SO-8



Top View
Pin Configuration



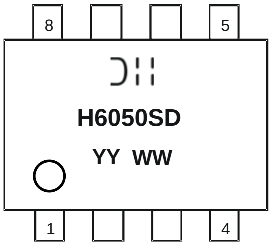
Equivalent Circuit

Ordering Information (Note 5)

Part Number	Case	Packaging
DMPH6050SSDQ-13	SO-8	2500 / 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 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. Automotive products are AEC-Q101 qualified and are PPAP capable. Refer to http://www.diodes.com/product_compliance_definitions.html.
5. For packaging details, go to our website at http://www.diodes.com/products/packages.html.

Marking Information



Ↄ¦¦ = Manufacturer’s Marking
H6050SD = Product Type Marking Code
YYWW = Date Code Marking
YY = Year (ex: 16 = 2016)
WW = Week (01 to 53)

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

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DSS}	-60	V
Gate-Source Voltage			V_{GSS}	±20	V
Continuous Drain Current (Note 7) V_{GS} = -10V	Steady State	T_A = +25°C T_A = +100°C	I_D	-5.2 -3.7	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)			I_{DM}	-35	A
Maximum Continuous Body Diode Forward Current (Note 7)			I_S	-2.0	A
Avalanche Current (Note 8) L = 0.1mH			I_{AS}	-25	A
Avalanche Energy (Note 8) L = 0.1mH			E_{AS}	33	mJ

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

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 6)	T_A = +25°C	P_D	1.5	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady state	$R_{\theta JA}$	103	°C/W
	t<10s		64	
Total Power Dissipation (Note 7)	T_A = +25°C	P_D	2.0	W
Thermal Resistance, Junction to Ambient (Note 7)	Steady state	$R_{\theta JA}$	75	°C/W
	t<10s		47	
Thermal Resistance, Junction to Case (Note 7)		$R_{\theta JC}$	13	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +175	°C

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 9)						
Drain-Source Breakdown Voltage	BV_{DSS}	-60	—	—	V	V_{GS} = 0V, I_D = -250µA
Zero Gate Voltage Drain Current T_J = +25°C	I_{DSS}	—	—	-1	µA	V_{DS} = -60V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 9)						
Gate Threshold Voltage	$V_{GS(TH)}$	-1.0	—	-3.0	V	V_{DS} = V_{GS}, I_D = -250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	34	48	mΩ	V_{GS} = -10V, I_D = -5A
			44	60		V_{GS} = -4.5V, I_D = -4A
Diode Forward Voltage	V_{SD}	—	-0.7	-1.2	V	V_{GS} = 0V, I_S = -1A
DYNAMIC CHARACTERISTICS (Note 10)						
Input Capacitance	C_{iss}	—	1525	—	pF	V_{DS} = -30V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	—	90	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	70	—	pF	
Gate Resistance	R_g	—	16	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = -4.5V)	Q_g	—	14.5	—	nC	V_{DS} = -30V, I_D = -5A
Total Gate Charge (V_{GS} = -10V)	Q_g	—	30.6	—	nC	
Gate-Source Charge	Q_{gs}	—	4.9	—	nC	
Gate-Drain Charge	Q_{gd}	—	5.2	—	nC	
Turn-On Delay Time	$t_{D(ON)}$	—	5.3	—	ns	V_{GS} = -10V, V_{DS} = -30V, R_G = 3Ω, I_D = -5A
Turn-On Rise Time	t_R	—	15.4	—	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	—	79.2	—	ns	
Turn-Off Fall Time	t_F	—	45.3	—	ns	
Body Diode Reverse Recovery Time	t_{RR}	—	15.2	—	ns	I_F = -5A, di/dt = -100A/µs
Body Diode Reverse Recovery Charge	Q_{RR}	—	9.3	—	nC	I_F = -5A, di/dt = -100A/µs

Notes:
6. Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
7. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate.
8. I_{AS} and E_{AS} ratings are based on low frequency and duty cycles to keep T_J = +25°C.
9. Short duration pulse test used to minimize self-heating effect.
10. Guaranteed by design. Not subject to product testing.

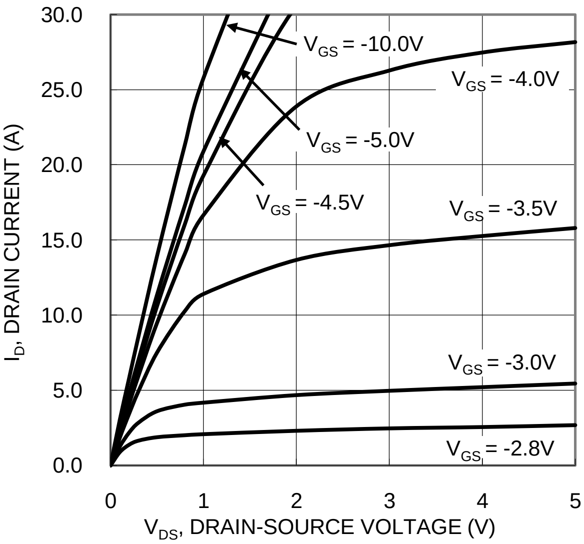


Figure 1. Typical Output Characteristic

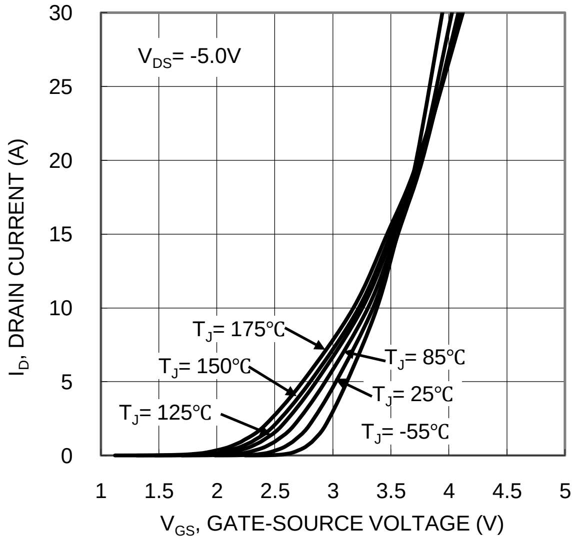


Figure 2. Typical Transfer Characteristic

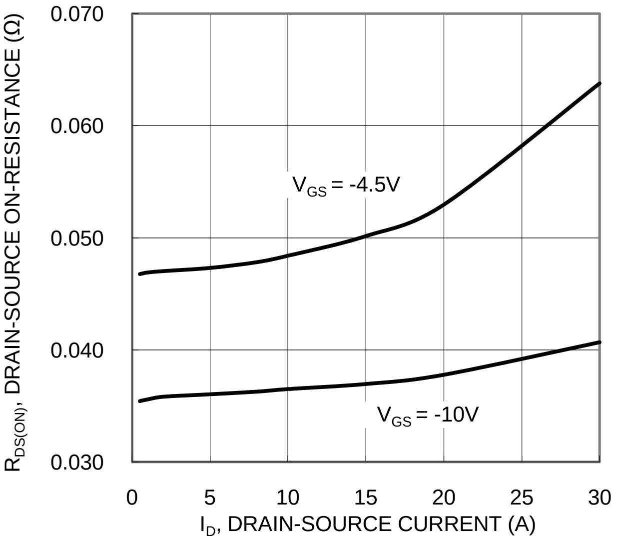


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

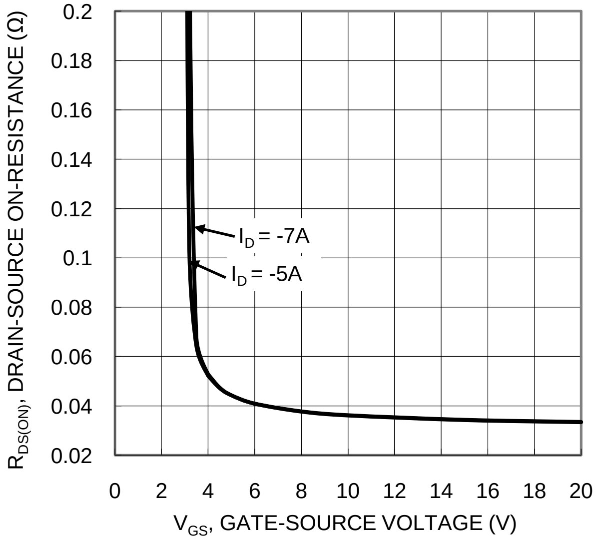


Figure 4. Typical Transfer Characteristic

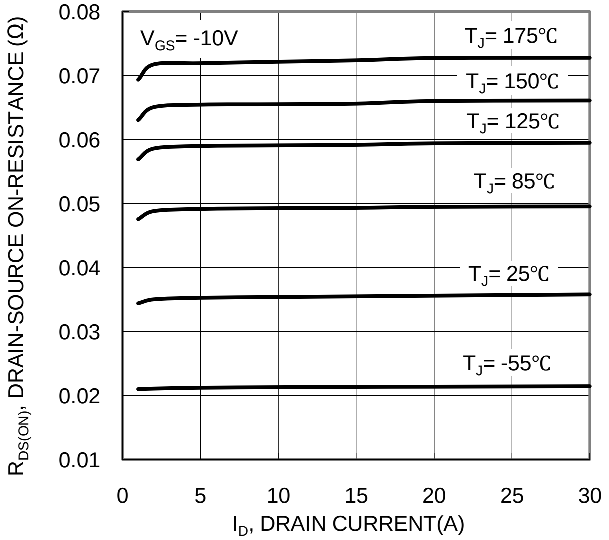


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

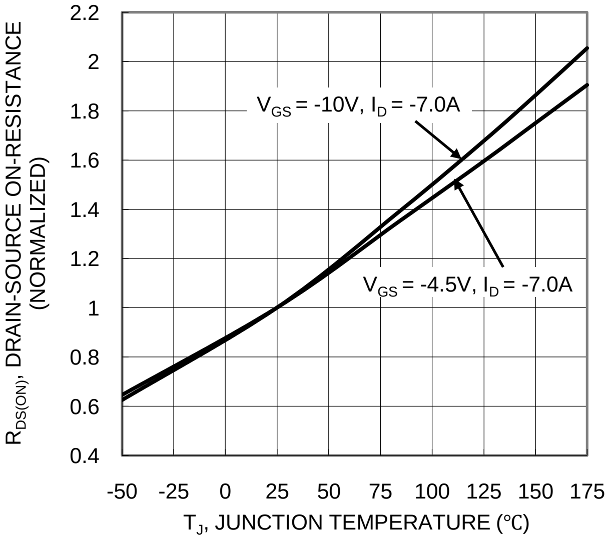


Figure 6. On-Resistance Variation with Temperature

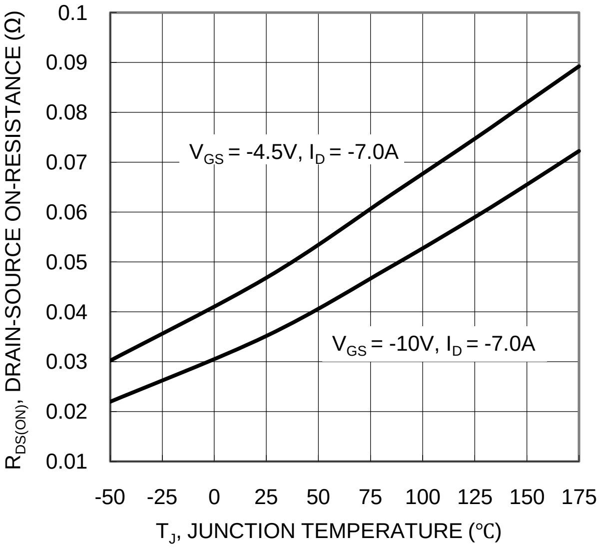


Figure 7. On-Resistance Variation with Temperature

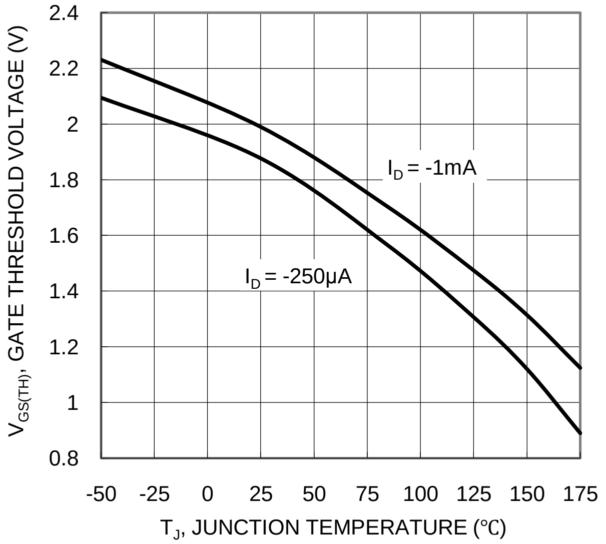


Figure 8. Gate Threshold Variation vs Temperature

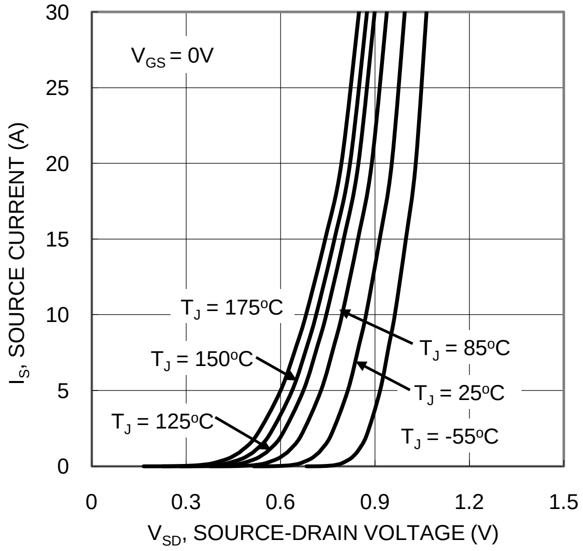


Figure 9. Diode Forward Voltage vs. Current

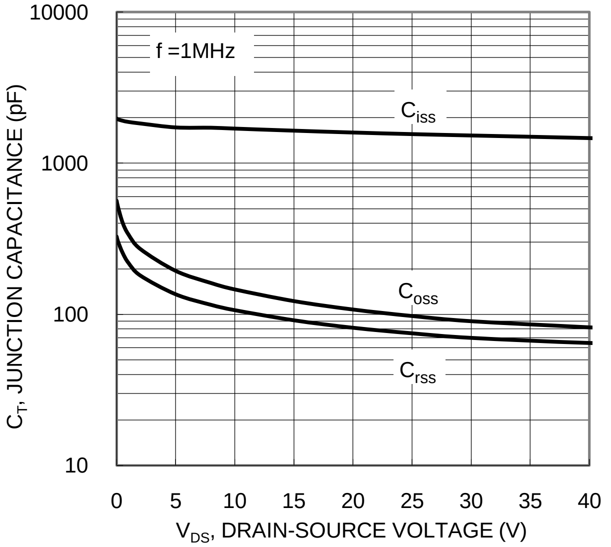


Figure 10. Typical Junction Capacitance

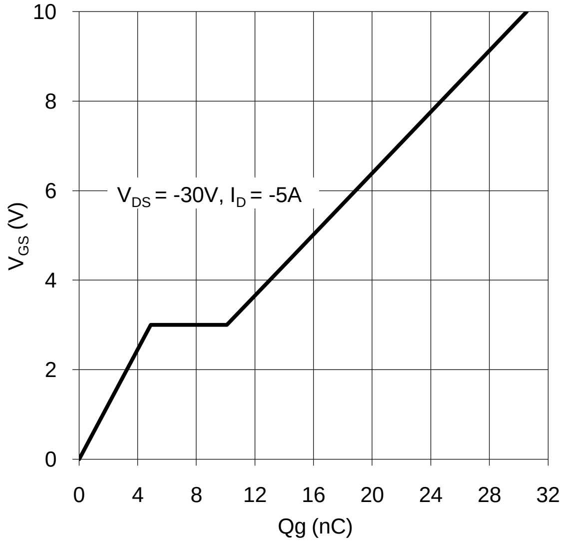


Figure 11. Gate Charge

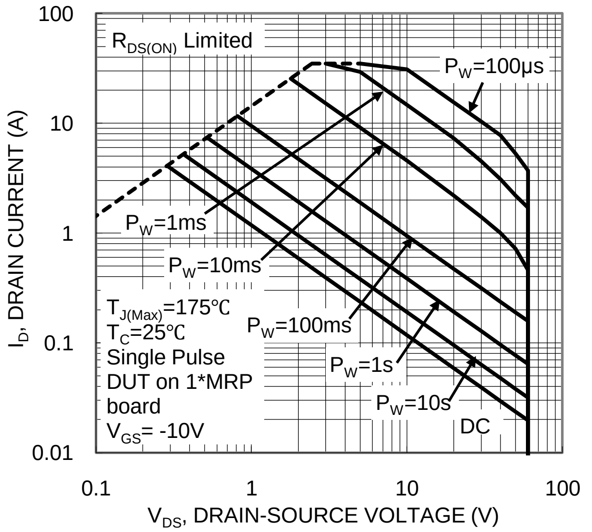


Figure 12. SOA, Safe Operation Area

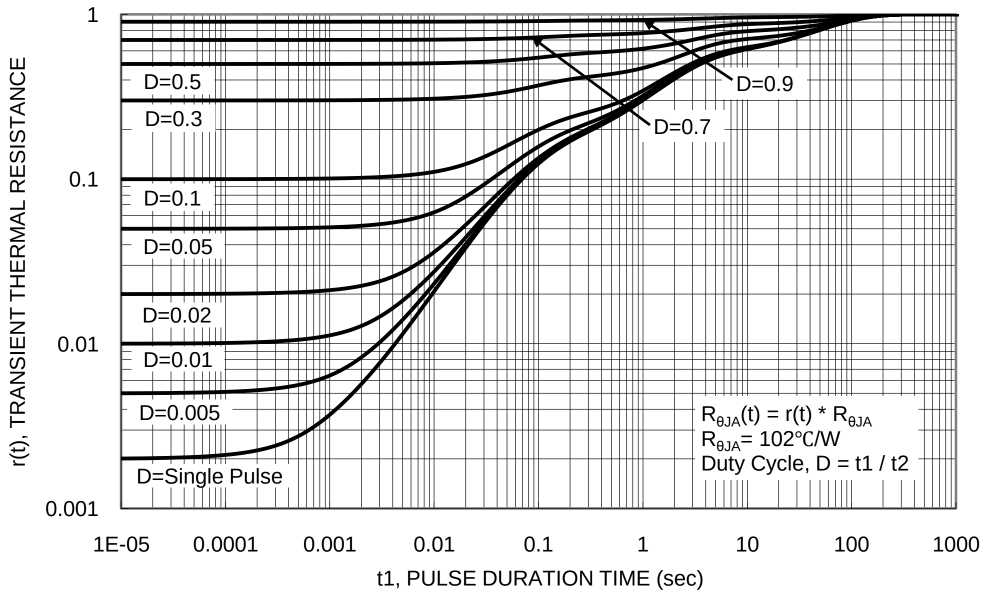


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

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

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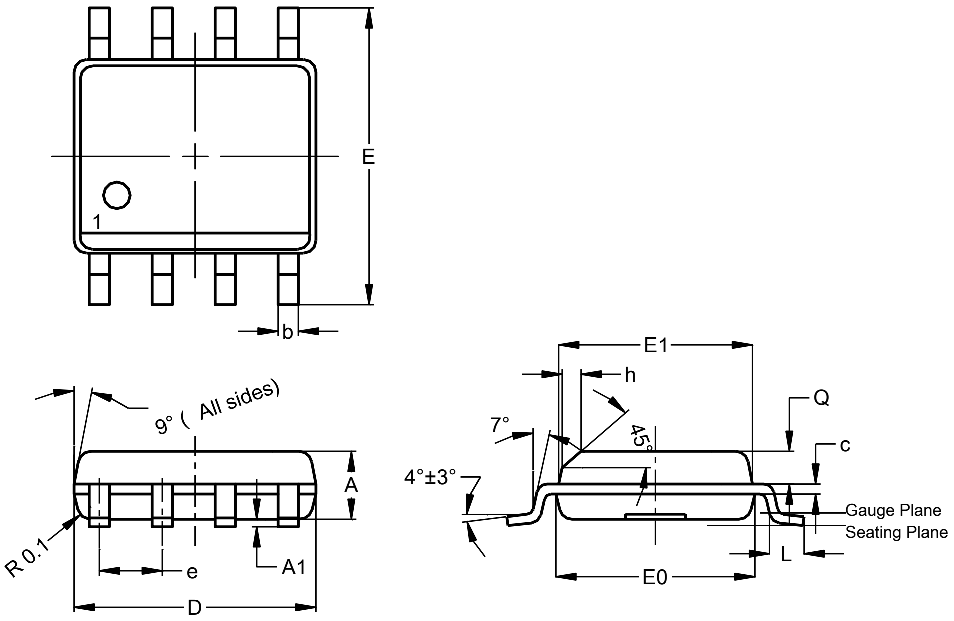

SO-8			
Dim	**Min**	**Max**	**Typ**
A	1.40	1.50	1.45
A1	0.10	0.20	0.15
b	0.30	0.50	0.40
c	0.15	0.25	0.20
D	4.85	4.95	4.90
E	5.90	6.10	6.00
E1	3.80	3.90	3.85
E0	3.85	3.95	3.90
e	--	--	1.27
h	-	--	0.35
L	0.62	0.82	0.72
Q	0.60	0.70	0.65
All Dimensions in mm			

Suggested Pad Layout

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

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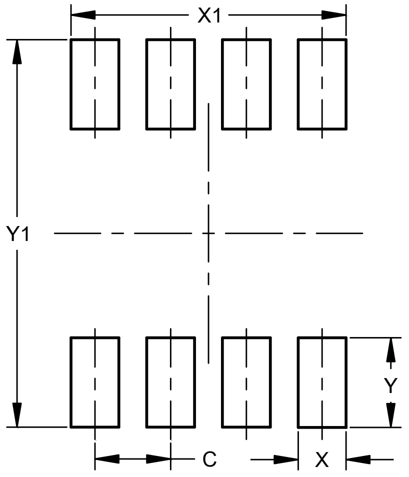

Dimensions	Value (in mm)
C	1.27
X	0.802
X1	4.612
Y	1.505
Y1	6.50