40V +175°C P-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

BV_{DSS}	$R_{DS(ON)}$ Max	I_D T_A = +25°C
-40V	11mΩ @ V_{GS} = -10V	-11A
	15mΩ @ V_{GS} = -4.5V	-10A

Features and Benefits

- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switch (UIS) Test in Production
- Low On-Resistance
- Low Input Capacitance
- **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-Q100/101/104/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please contact us or your local Diodes representative. https://www.diodes.com/quality/product-definitions/**

Description and Applications

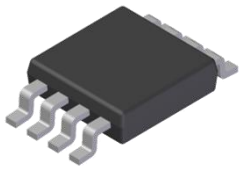
This new generation MOSFET has been designed to minimize the on-state resistance ($R_{DS(ON)}$) yet maintain superior switching performance, making it ideal for high-efficiency power-management applications.

- DC-DC converters
- Power-management functions
- Analog switches

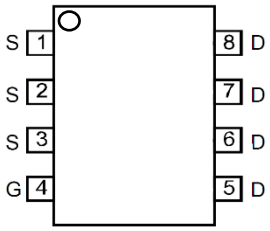
Mechanical Data

- 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 Lead-Frame. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.074 grams (Approximate)

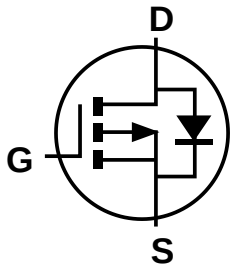
SO-8



Top View



Top View



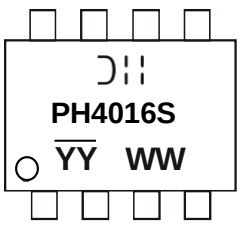
Equivalent Circuit

Ordering Information (Note 4)

Part Number	Package	Packing	
		Qty.	Carrier
DMPH4016SSS-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
PH4016S = Product Type Marking Code
YYWW = Date Code Marking
YY = Year (ex: 23 = 2023)
WW = Week (01 to 53)

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

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DSS}	-40	V
Gate-Source Voltage			V_{GSS}	±20	V
Continuous Drain Current (Note 5) V_{GS} = -10V	Steady State	T_A = +25°C T_A = +100°C	I_D	-11 -8	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)			I_{DM}	-121	A
Maximum Body Diode Continuous Current (Note 5)			I_S	-11	A
Avalanche Current, L = 1mH			I_{AS}	-26	A
Avalanche Energy, L = 1mH			E_{AS}	338	mJ

Thermal Characteristics

Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 6)	P_D	1.9	W
Thermal Resistance, Junction to Ambient (Note 6)	$R_{\theta JA}$	80.2	°C/W
Total Power Dissipation (Note 5)	P_D	2.5	W
Thermal Resistance, Junction to Ambient (Note 5)	$R_{\theta JA}$	60.4	°C/W
Thermal Resistance, Junction to Case (Note 5)	$R_{\theta JC}$	7.8	°C/W
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 7)						
Drain-Source Breakdown Voltage	BV_{DSS}	-40	—	—	V	V_{GS} = 0V, I_D = -250µA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	-1	µA	V_{DS} = -40V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	-1.5	—	-2.5	V	V_{DS} = V_{GS}, I_D = -250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	6	11	mΩ	V_{GS} = -10V, I_D = -9.8A
		—	8.5	15		V_{GS} = -4.5V, I_D = -9.8A
Diode Forward Voltage	V_{SD}	—	-0.7	-1	V	V_{GS} = 0V, I_S = -1A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	5697	—	pF	V_{DS} = -20V, V_{GS} = 0V f = 1MHz
Output Capacitance	C_{oss}	—	534	—		
Reverse Transfer Capacitance	C_{rss}	—	408	—		
Gate Resistance	R_G	—	7	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = -4.5V)	Q_g	—	53	—	nC	V_{DS} = -20V, I_D = -9.8A
Total Gate Charge (V_{GS} = -10V)	Q_g	—	112	—		
Gate-Source Charge	Q_{gs}	—	20	—		
Gate-Drain Charge	Q_{gd}	—	18	—		
Turn-On Delay Time	$t_{D(ON)}$	—	11.5	—	ns	V_{GS} = -10V, V_{DD} = -20V R_G = 2Ω, I_D = -9.8A
Turn-On Rise Time	t_R	—	41	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	146	—		
Turn-Off Fall Time	t_F	—	165	—		
Reverse Recovery Time	t_{RR}	—	27	—	ns	I_F = -9.8A, dI/dt = -100A/µs
Reverse Recovery Charge	Q_{RR}	—	22	—	nC	I_F = -9.8A, dI/dt = -100A/µs

Notes:
5. Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate.
6. Device mounted on FR-4 PC board, with minimum recommended pad layout, single sided.
7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to product testing.

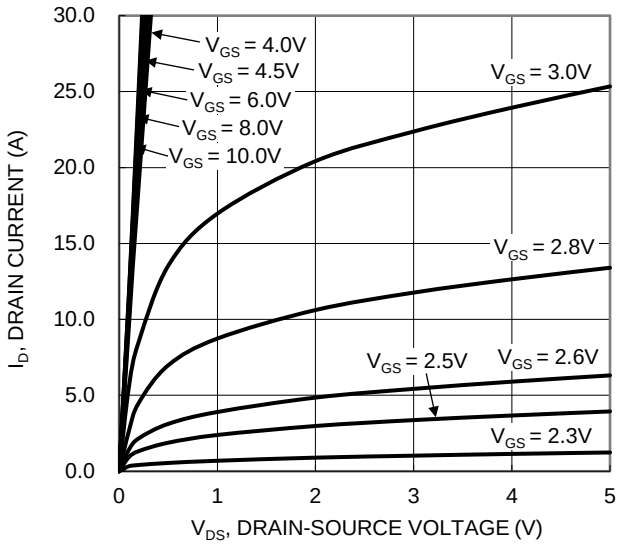


Figure 1. Typical Output Characteristic

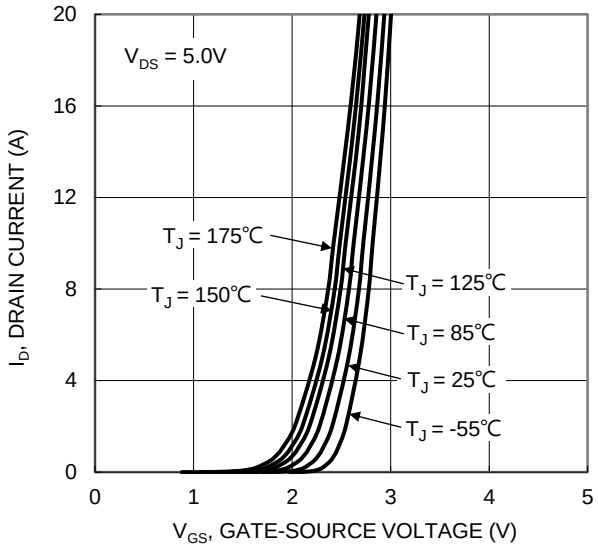


Figure 2. Typical Transfer Characteristic

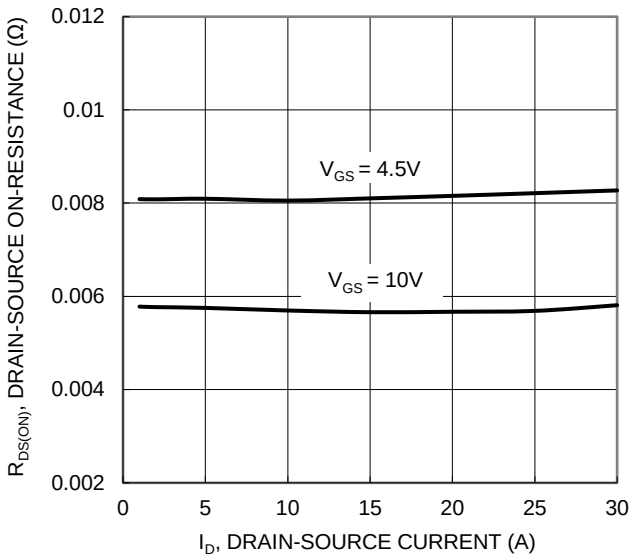


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

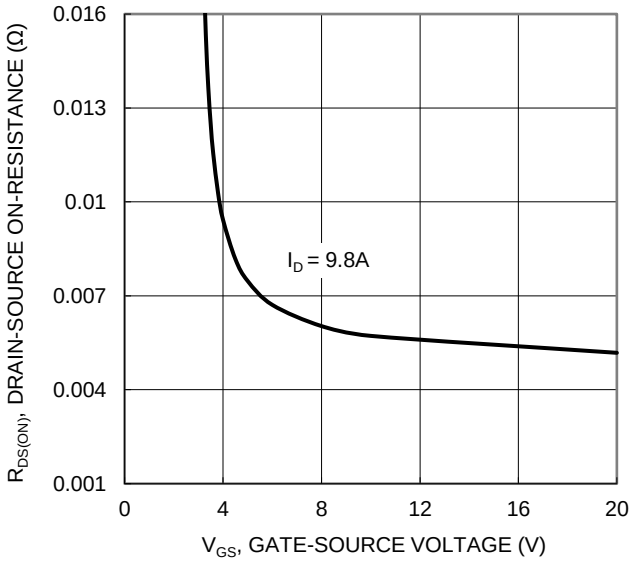


Figure 4. Typical Transfer Characteristic

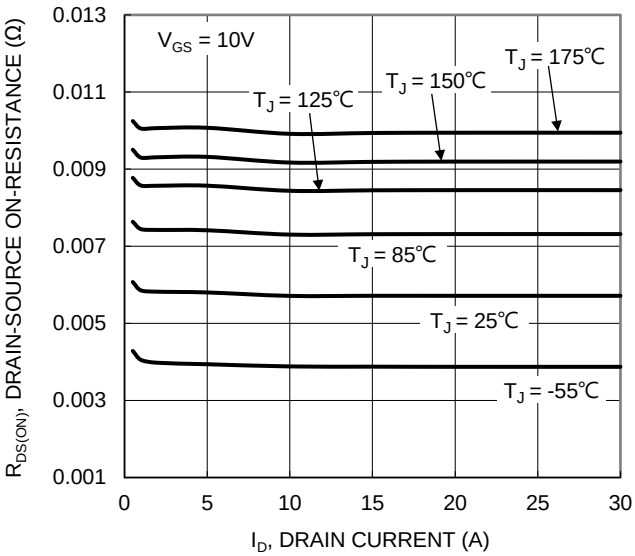


Figure 5. Typical On-Resistance vs. Drain Current and Junction Temperature

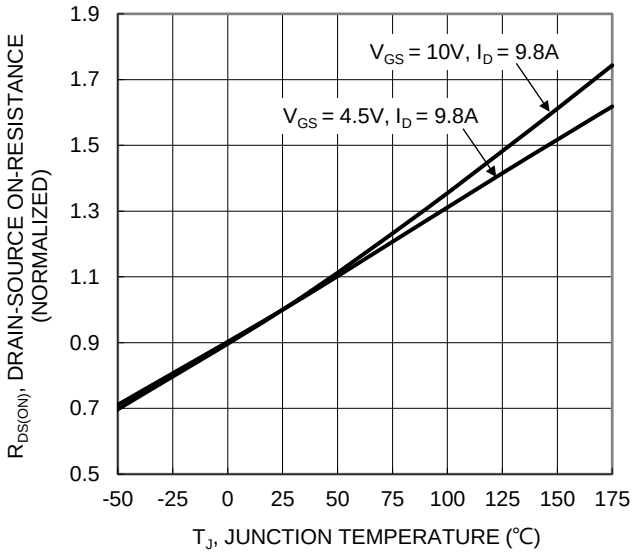


Figure 6. On-Resistance Variation with Junction Temperature

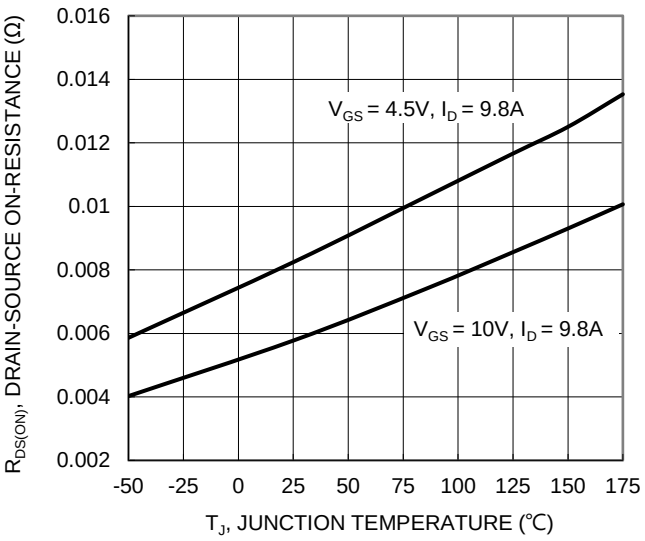


Figure 7. On-Resistance Variation with Junction Temperature

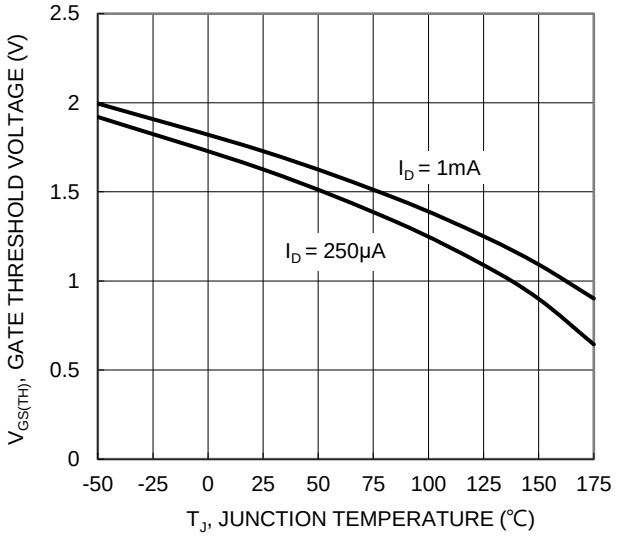


Figure 8. Gate Threshold Variation vs. Junction Temperature

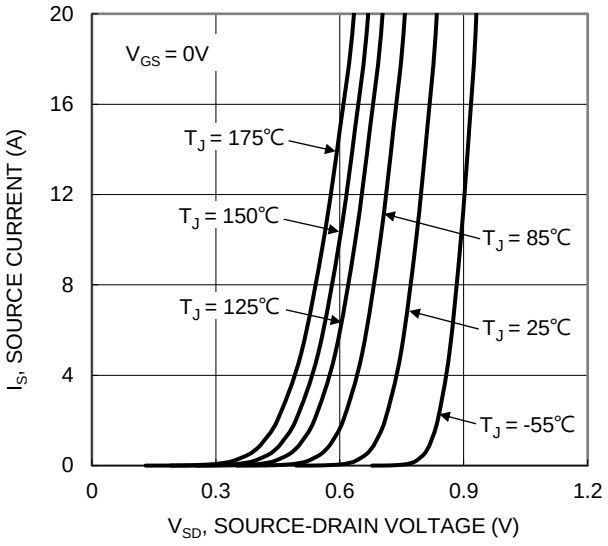


Figure 9. Diode Forward Voltage vs. Current

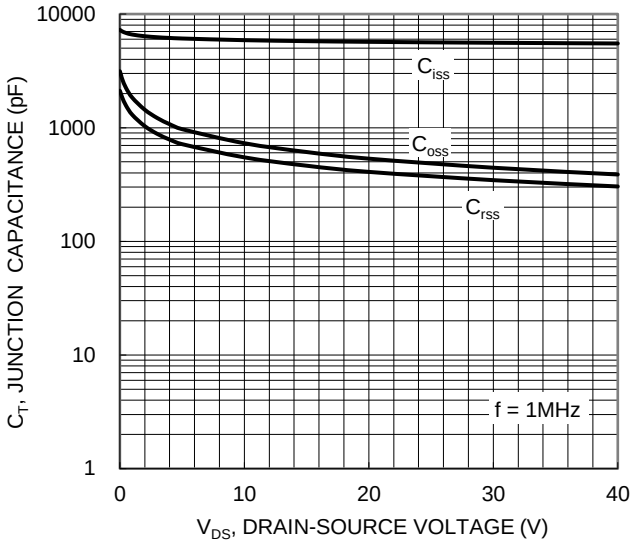


Figure 10. Typical Junction Capacitance

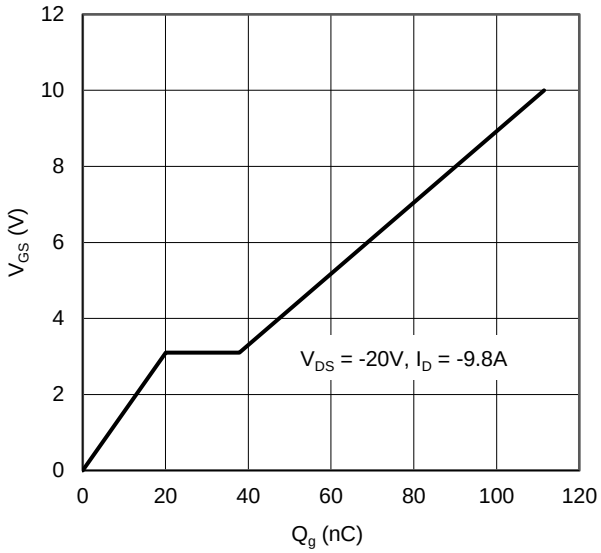


Figure 11. Gate Charge

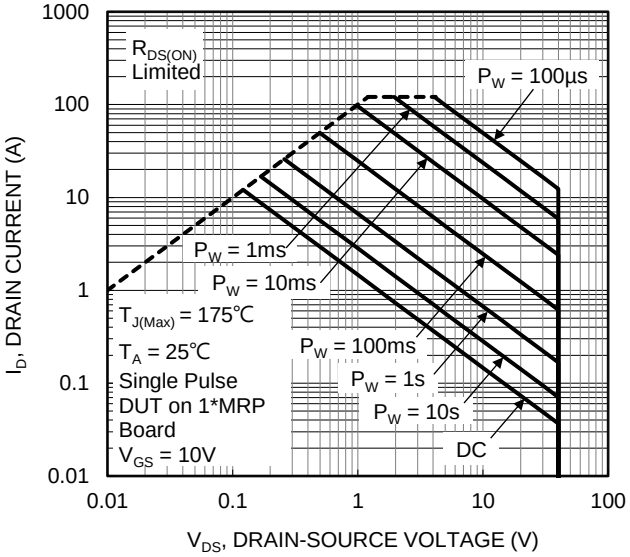


Figure 12. SOA, Safe Operation Area

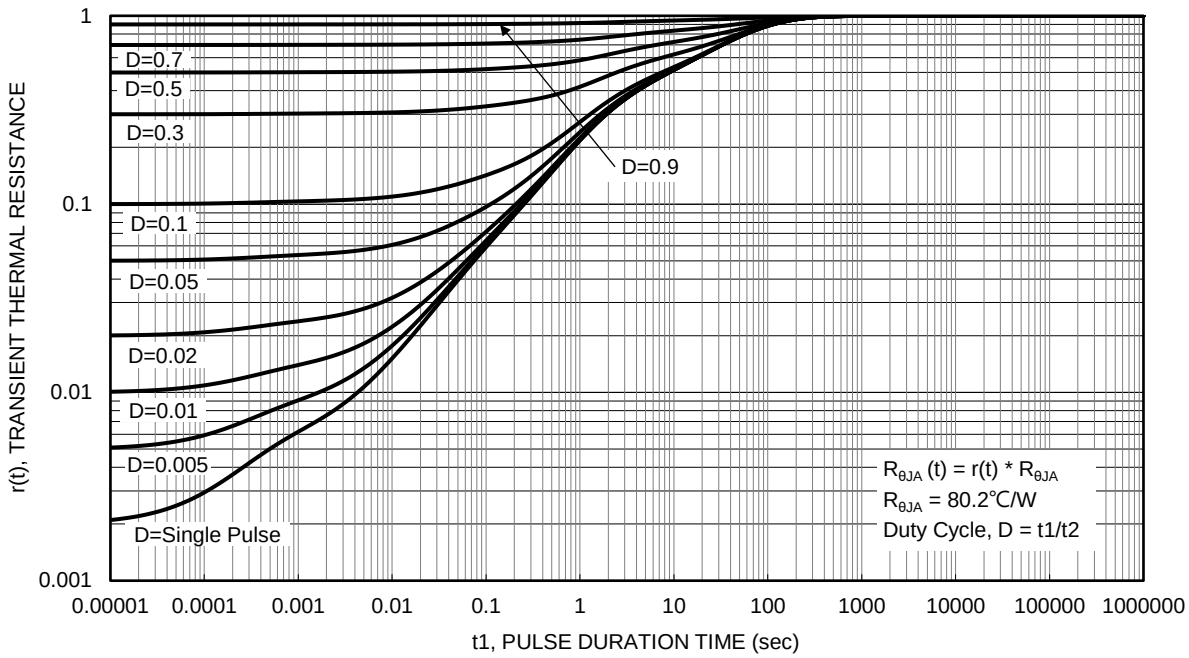
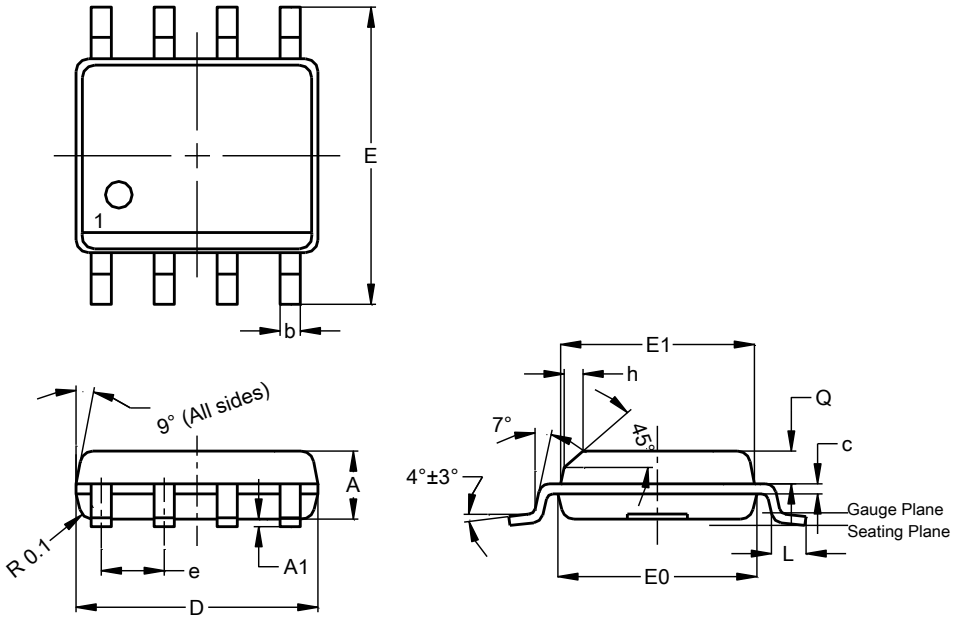


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

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

SO-8

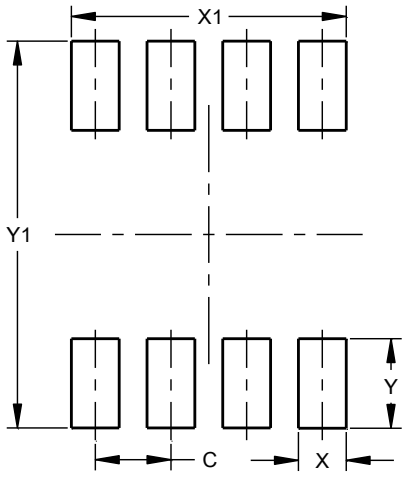


SO-8			
Dim	**Min**	**Max**	**Typ**
A	1.40	1.50	1.45
A1	0.10	0.20	0.15
b	0.30	0.50	0.40
c	0.15	0.25	0.20
D	4.85	4.95	4.90
E	5.90	6.10	6.00
E1	3.80	3.90	3.85
E0	3.85	3.95	3.90
e	--	--	1.27
h	--	--	0.35
L	0.62	0.82	0.72
Q	0.60	0.70	0.65
All Dimensions in mm			

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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