

**40V +175°C DUAL N-CHANNEL ENHANCEMENT MODE MOSFET**
**Product Summary**

$V_{(BR)DSS}$	$R_{DS(on) \max}$	$I_D$ $T_A = +25^\circ\text{C}$
40V	15m $\Omega$ @ $V_{GS} = 10\text{V}$	8.6A
	20m $\Omega$ @ $V_{GS} = 4.5\text{V}$	7.5A

**Features and Benefits**

- Rated to +175°C – Ideal for High Ambient Temperature Environments
- 100% Unclamped Inductive Switching – Ensures More Reliable and Robust End Application
- Low  $R_{DS(ON)}$  – Minimizes Power Losses
- Low  $Q_g$  – Minimizes 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)**

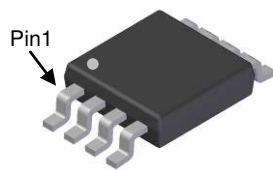
**Description and Applications**

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:

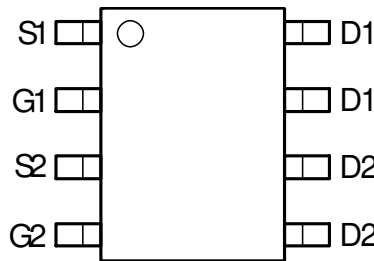
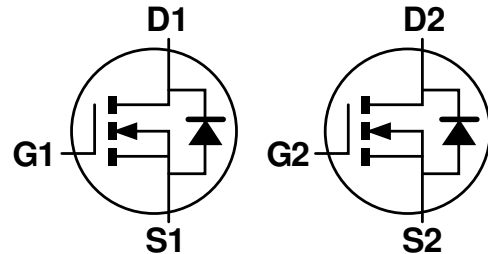
- Engine Management Systems
- Body Control
- DC-DC Converters

**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 – Tin Finish Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208  $\text{\textcircled{E}}$
- Weight: 0.074 grams (Approximate)



Top View

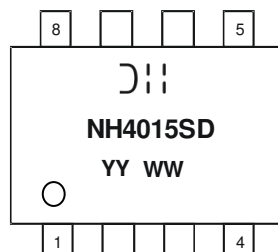

 Top View  
Pin Configuration


Equivalent Circuit

**Ordering Information** (Note 5)

Part Number	Case	Packaging
DMNH4015SSDQ-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. Automotive products are AEC-Q101 qualified and are PPAP capable. Refer to [http://www.diodes.com/product\\_compliance\\_definitions.html](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**


$\text{D}||$  = Manufacturer's Marking  
 NH4015SD = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Year (ex: 16 = 2016)  
 WW = Week (01 - 53)

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

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V <sub>DSS</sub>	40	V
Gate-Source Voltage			V <sub>GSS</sub>	±20	V
Continuous Drain Current (Note 7) V <sub>GS</sub> = 10V	Steady State	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	8.6 6.9	A
	t < 10s	T <sub>A</sub> = +25°C T <sub>A</sub> = +70°C	I <sub>D</sub>	11.0 8.8	A
Maximum Body Diode Forward Current (Note 7)			I <sub>S</sub>	2.2	A
Pulsed Drain Current (380µs pulse, duty cycle = 1%)			I <sub>DM</sub>	80	A
Avalanche Current (Note 8) L = 0.1mH			I <sub>AS</sub>	25	A
Avalanche Energy (Note 8) L = 0.1mH			E <sub>AS</sub>	33	mJ

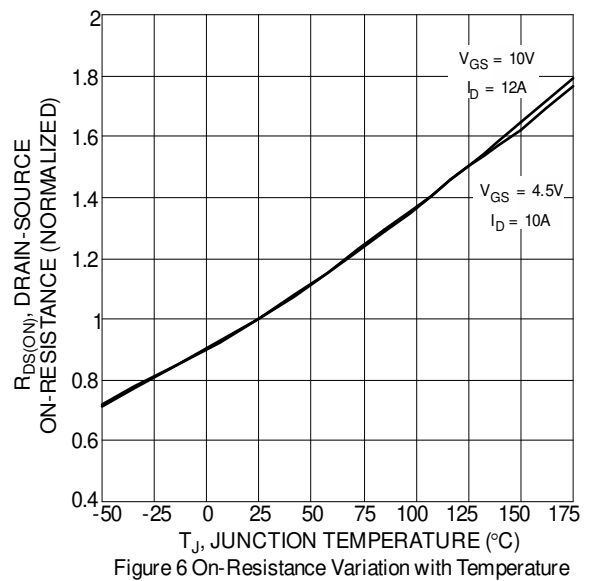
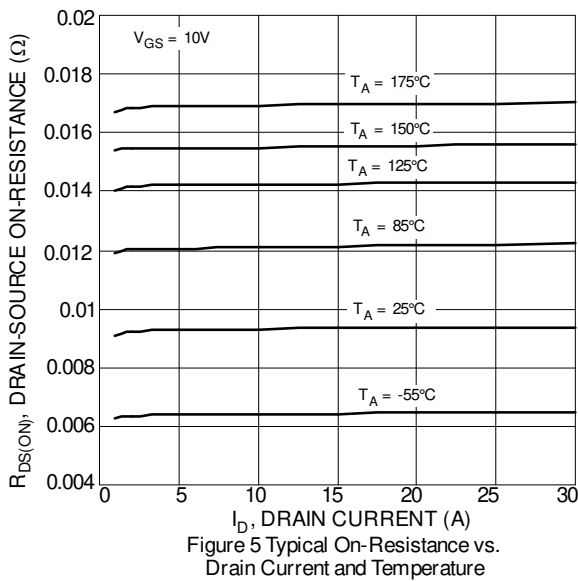
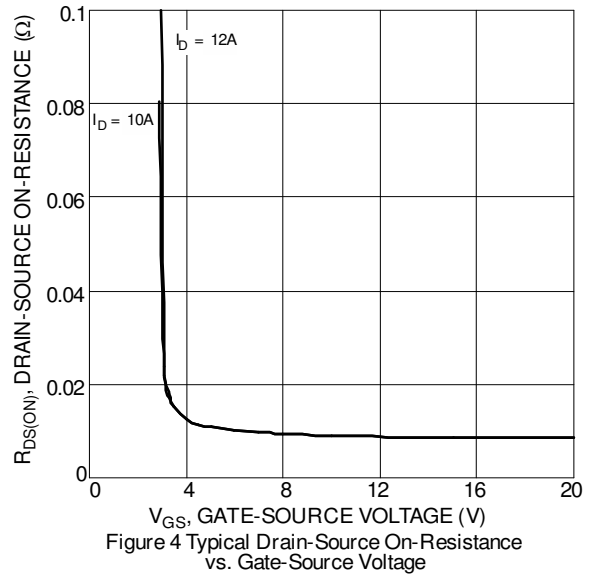
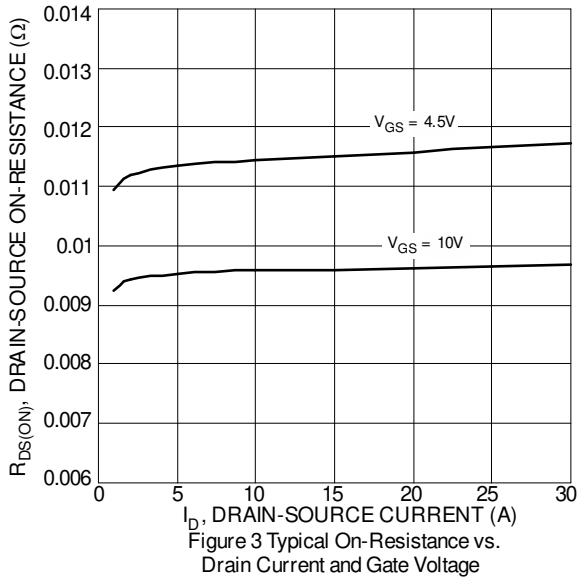
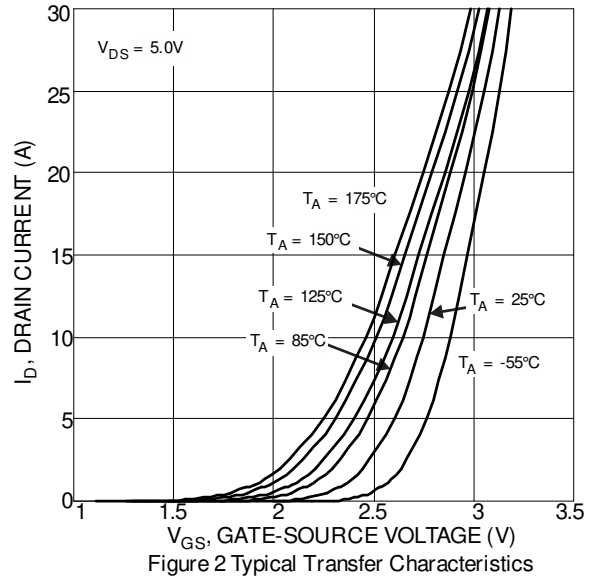
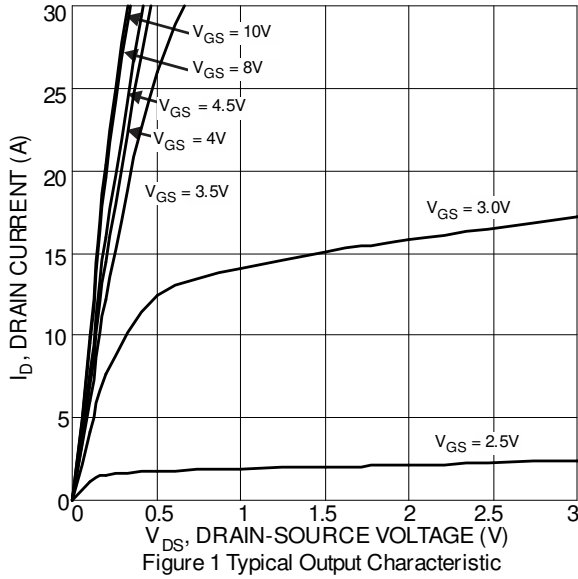
**Thermal Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 6)	T <sub>A</sub> = +25°C	P <sub>D</sub>	1.4	W
	T <sub>A</sub> = +70°C		0.9	
Thermal Resistance, Junction to Ambient (Note 6)	Steady state	R <sub>θJA</sub>	111	°C/W
	t < 10s		66	
Total Power Dissipation (Note 7)	T <sub>A</sub> = +25°C	P <sub>D</sub>	2.0	W
	T <sub>A</sub> = +70°C		1.2	
Thermal Resistance, Junction to Ambient (Note 7)	Steady state	R <sub>θJA</sub>	75	°C/W
	t < 10s		45	
Thermal Resistance, Junction to Case (Note 7)		R <sub>θJC</sub>	10.4	
Operating and Storage Temperature Range		T <sub>J</sub> , T <sub>STG</sub>	-55 to +175	°C

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 9)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	40	—	—	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> = 40V, 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 9)</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	1	—	3	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250µA
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	—	10	15	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> = 12A
		—	12	20		V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 10A
Diode Forward Voltage	V <sub>SD</sub>	—	0.7	1.0	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 1A
<b>DYNAMIC CHARACTERISTICS (Note 10)</b>						
Input Capacitance	C <sub>iss</sub>	—	1,938	-	pF	V <sub>DS</sub> = 15V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	156	-		
Reverse Transfer Capacitance	C <sub>rss</sub>	—	126	-		
Gate Resistance	R <sub>G</sub>	—	1.8	3.2	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>	—	15	-	nC	V <sub>DS</sub> = 15V, I <sub>D</sub> = 12A
Total Gate Charge (V <sub>GS</sub> = 10V)	Q <sub>g</sub>	—	33	-		
Gate-Source Charge	Q <sub>gs</sub>	—	4.4	-		
Gate-Drain Charge	Q <sub>gd</sub>	—	5.9	-		
Turn-On Delay Time	t <sub>D(on)</sub>	—	4.4	-	nS	V <sub>DD</sub> = 15V, V <sub>GS</sub> = 10V, R <sub>L</sub> = 1.25Ω, R <sub>G</sub> = 3Ω,
Turn-On Rise Time	t <sub>r</sub>	—	10.5	-		
Turn-Off Delay Time	t <sub>D(off)</sub>	—	12.3	-		
Turn-Off Fall Time	t <sub>f</sub>	—	5.7	-		
Body Diode Reverse Recovery Time	t <sub>rr</sub>	—	11	—	nS	I <sub>S</sub> = 12A, di/dt = 500A/µs
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>	—	7.6	—	nC	

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



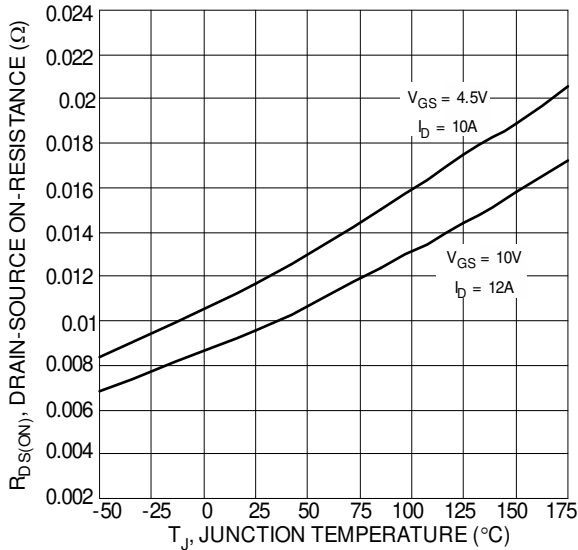


Figure 7 On-Resistance Variation with Temperature

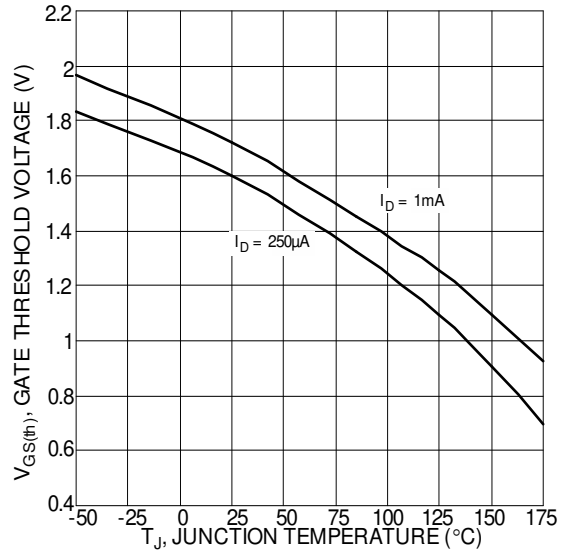


Figure 8 Gate Threshold Variation vs. Ambient Temperature

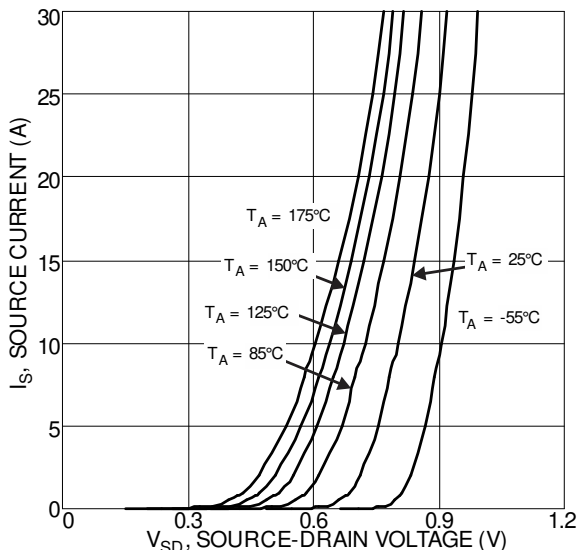


Figure 9 Diode Forward Voltage vs. Current

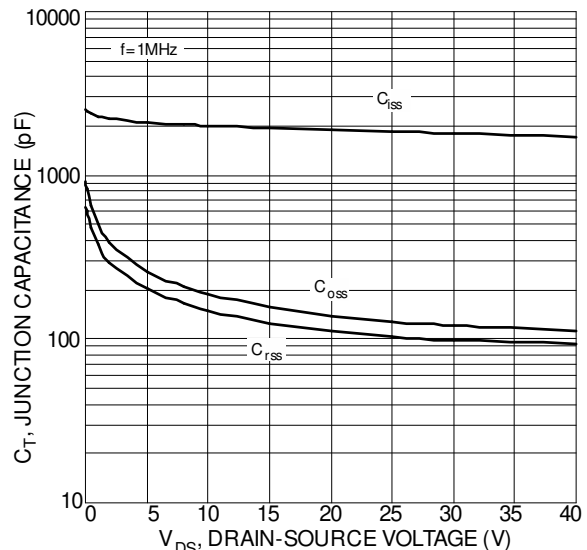


Figure 10 Typical Junction Capacitance

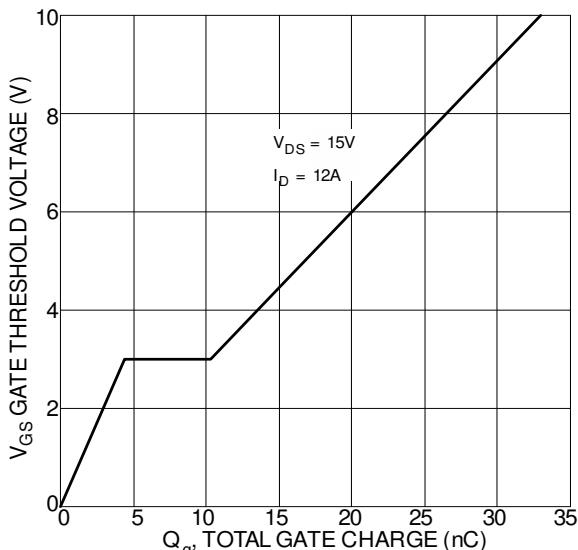


Figure 11 Gate Charge

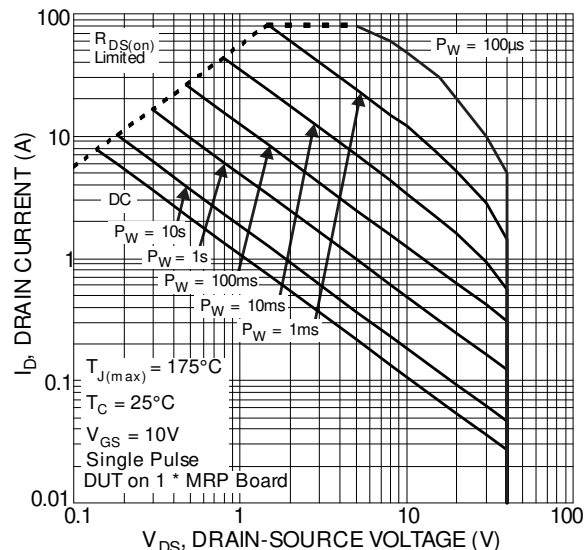
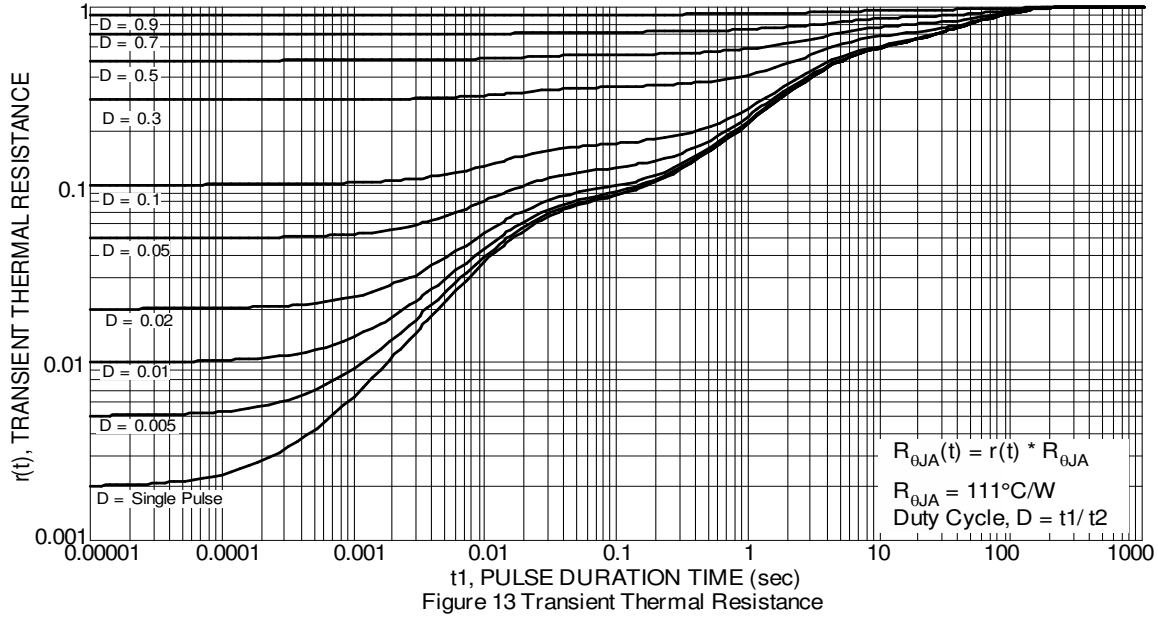


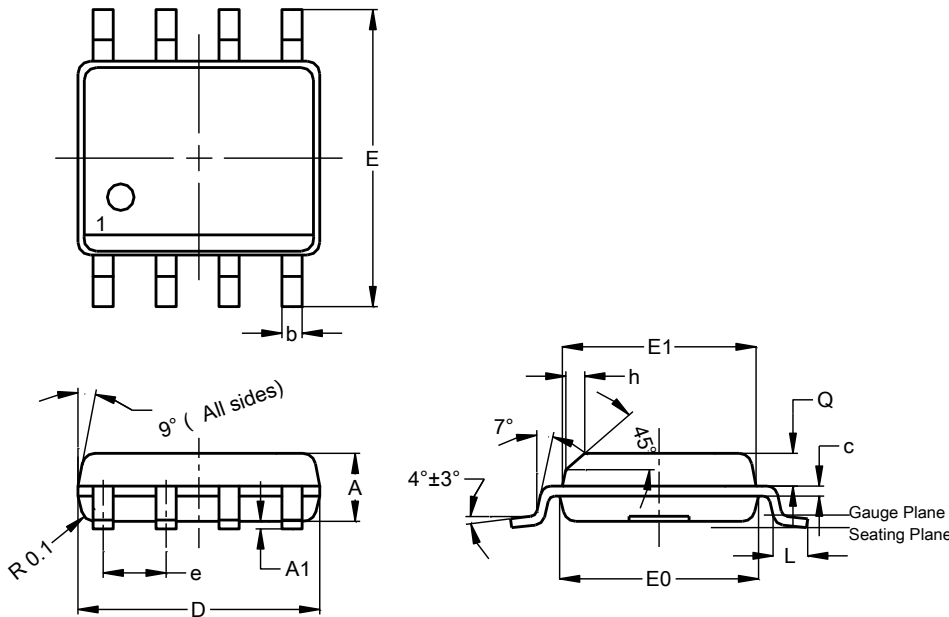
Figure 12 SOA, Safe Operation Area



**Package Outline Dimensions**

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

**SO-8**

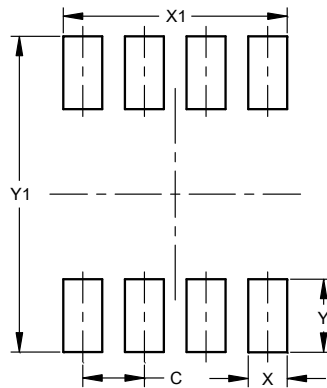


SO-8			
Dim	Min	Max	Typ
A	1.40	1.50	1.45
A1	0.10	0.20	0.15
b	0.30	0.50	0.40
c	0.15	0.25	0.20
D	4.85	4.95	4.90
E	5.90	6.10	6.00
E1	3.80	3.90	3.85
E0	3.85	3.95	3.90
e	--	--	1.27
h	-	--	0.35
L	0.62	0.82	0.72
Q	0.60	0.70	0.65
All Dimensions in mm			

## 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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