

## Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)} \text{ Max}$	$I_D$ $T_A = +25^\circ\text{C}$
60V	40m $\Omega$ @ $V_{GS} = 10\text{V}$	5.0A
	55m $\Omega$ @ $V_{GS} = 4.5\text{V}$	4.4A

## Description and Applications

This new generation MOSFET is 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.

- DC-DC Converters
- Power Management Functions
- Backlighting

## Features and Benefits

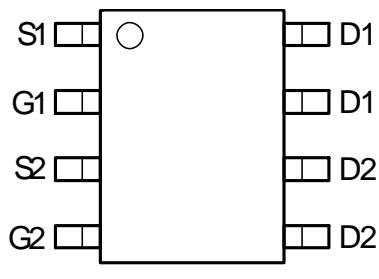
- Low Input Capacitance
- Low On-Resistance
- Fast Switching Speed
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- Qualified to AEC-Q101 Standards for High Reliability
- An Automotive-Compliant Part is Available Under Separate Data Sheet ([DMN6040SSDQ](#))

## Mechanical Data

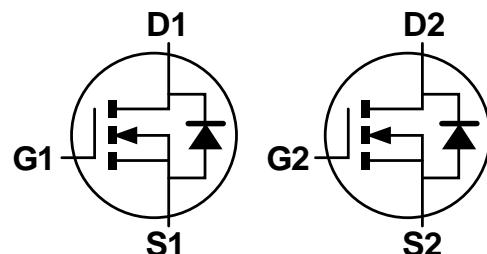
- Case: SO-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Finish – Tin Finish Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208
- Weight: 0.074 grams (Approximate)



Top View



Top View  
Pin Configuration



Equivalent Circuit

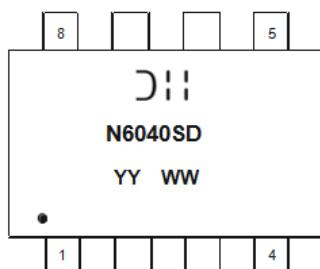
## Ordering Information (Note 4)

Part Number	Case	Packaging
DMN6040SSD-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



**DII** = Manufacturer's Marking  
 N6040SD = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY or YY = Year (ex: 16= 2016)  
 WW = Week (01 - 53)

**Maximum Ratings** (@ $T_A = +25^\circ\text{C}$  unless otherwise specified)

Characteristic			Symbol	Value	Units
Drain-Source Voltage			$V_{DSS}$	60	V
Gate-Source Voltage			$V_{GSS}$	$\pm 20$	V
Continuous Drain Current (Note 6) $V_{GS} = 10\text{V}$	Steady State	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	$I_D$	5.0 4.1	A
	$t < 10\text{s}$	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	$I_D$	6.6 5.3	A
Maximum Body Diode Forward Current (Note 6)			$I_S$	2.5	A
Pulsed Drain Current (10 $\mu\text{s}$ pulse, duty cycle = 1%)			$I_{DM}$	30	A
Pulsed Body Diode Forward Current (10 $\mu\text{s}$ Pulse, Duty Cycle = 1%)			$I_{SM}$	30	A
Avalanche Current (Note 7) $L = 0.1\text{mH}$			$I_{AS}$	14.2	A
Avalanche Energy (Note 7) $L = 0.1\text{mH}$			$E_{AS}$	10	mJ

**Thermal Characteristics** (@ $T_A = +25^\circ\text{C}$  unless otherwise specified)

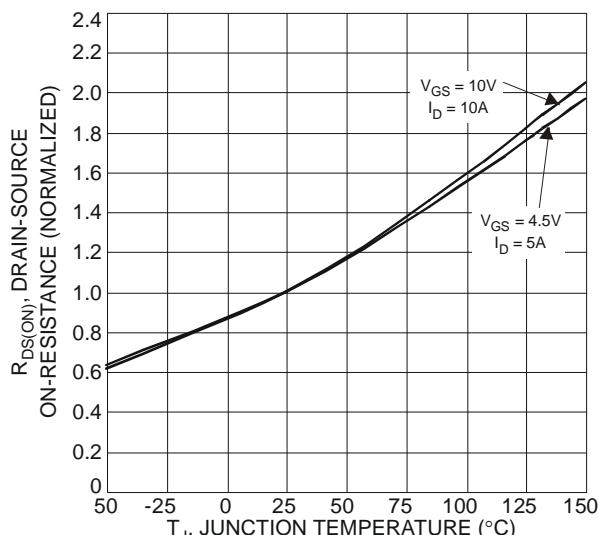
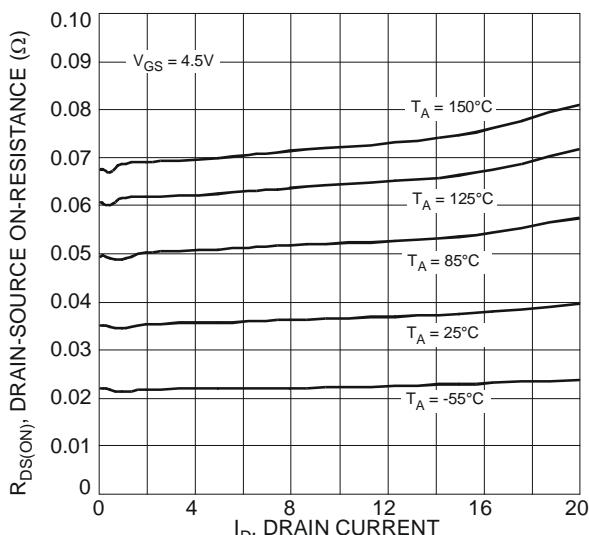
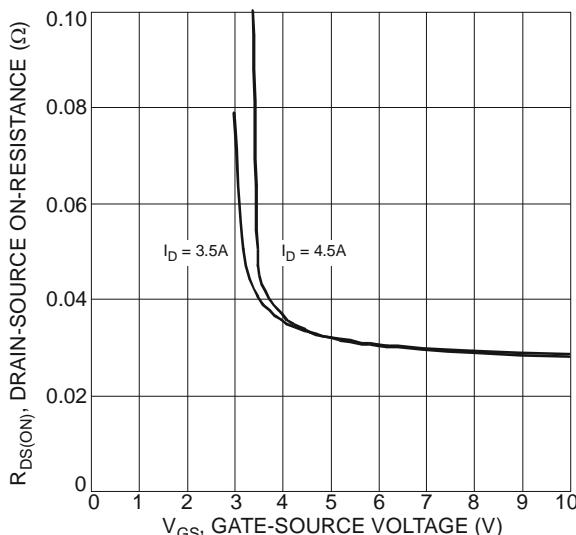
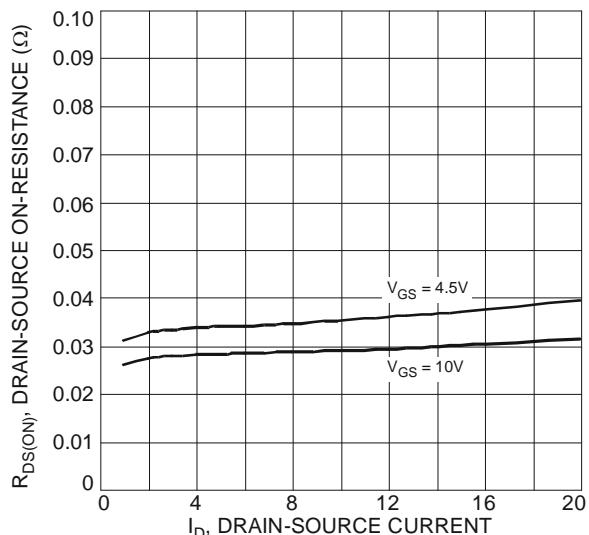
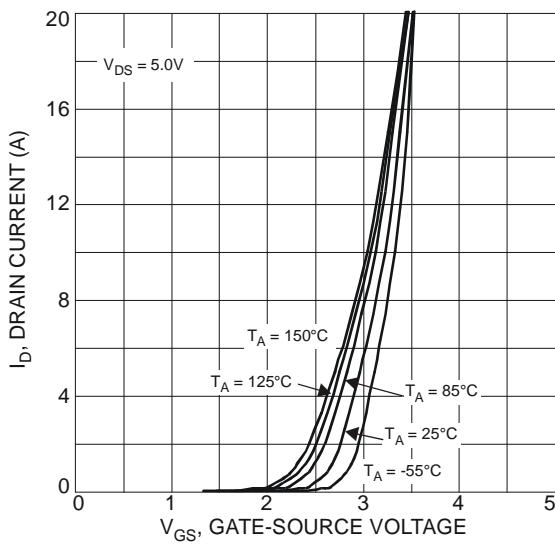
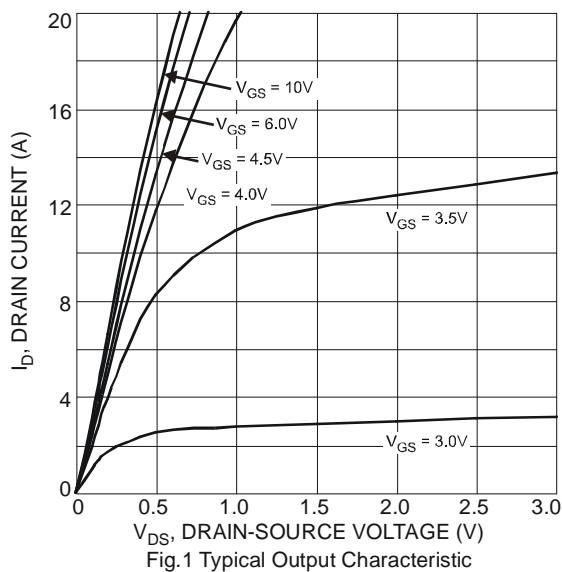
Characteristic			Symbol	Value	Units
Total Power Dissipation (Note 5)	$T_A = +25^\circ\text{C}$		$P_D$	1.3	W
	$T_A = +70^\circ\text{C}$			0.8	
Thermal Resistance, Junction to Ambient (Note 5)	Steady State		$R_{\theta JA}$	102	$^\circ\text{C}/\text{W}$
	$t < 10\text{s}$			61	
Total Power Dissipation (Note 6)	$T_A = +25^\circ\text{C}$		$P_D$	1.7	W
	$T_A = +70^\circ\text{C}$			1.1	
Thermal Resistance, Junction to Ambient (Note 6)	Steady State		$R_{\theta JA}$	75	$^\circ\text{C}/\text{W}$
	$t < 10\text{s}$			50	
Thermal Resistance, Junction to Case (Note 6)			$R_{\theta JC}$	14.5	
Operating and Storage Temperature Range	$T_J, T_{STG}$			-55 to +150	$^\circ\text{C}$

**Electrical Characteristics** (@ $T_A = 25^\circ\text{C}$  unless otherwise specified)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b> (Note 8)						
Drain-Source Breakdown Voltage	$BV_{DSS}$	60	—	—	V	$V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$
Zero Gate Voltage Drain Current	$I_{DSS}$	—	—	100	nA	$V_{DS} = 60\text{V}, V_{GS} = 0\text{V}$
Gate-Source Leakage	$I_{GSS}$	—	—	$\pm 100$	nA	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$
<b>ON CHARACTERISTICS</b> (Note 8)						
Gate Threshold Voltage	$V_{GS(\text{TH})}$	1	—	3	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(\text{ON})}$	—	30	40	$\text{m}\Omega$	$V_{GS} = 10\text{V}, I_D = 4.5\text{A}$
		—	35	55		$V_{GS} = 4.5\text{V}, I_D = 3.5\text{A}$
Forward Transfer Admittance	$ Y_{FS} $	—	4.5	—	S	$V_{DS} = 10\text{V}, I_D = 4.3\text{A}$
Diode Forward Voltage	$V_{SD}$	—	0.7	1.2	V	$V_{GS} = 0\text{V}, I_S = 1\text{A}$
<b>DYNAMIC CHARACTERISTICS</b> (Note 9)						
Input Capacitance	$C_{ISS}$	—	1,287	—	$\text{pF}$	$V_{DS} = 25\text{V}, V_{GS} = 0\text{V}$ $f = 1.0\text{MHz}$
Output Capacitance	$C_{OSS}$	—	57	—		
Reverse Transfer Capacitance	$C_{RSS}$	—	44	—		
Gate Resistance	$R_G$	—	1.2	—	$\Omega$	$V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$
Total Gate Charge ( $V_{GS} = 10\text{V}$ )	$Q_G$	—	22.4	—	$\text{nC}$	$V_{DS} = 30\text{V}, I_D = 4.3\text{A}$
Total Gate Charge ( $V_{GS} = 4.5\text{V}$ )	$Q_G$	—	10.4	—		
Gate-Source Charge	$Q_{GS}$	—	4.9	—		
Gate-Drain Charge	$Q_{GD}$	—	3.0	—		
Turn-On Delay Time	$t_{D(\text{ON})}$	—	6.6	—	$\text{ns}$	$V_{GS} = 10\text{V}, V_{DD} = 30\text{V}, R_G = 6\Omega, I_D = 4.3\text{A}$
Turn-On Rise Time	$t_R$	—	8.1	—		
Turn-Off Delay Time	$t_{D(\text{OFF})}$	—	20.1	—		
Turn-Off Fall Time	$t_F$	—	4.0	—		
Body Diode Reverse Recovery Time	$t_{RR}$	—	18	—	$\text{ns}$	$I_S = 4.3\text{A}, di/dt = 100\text{A}/\mu\text{s}$
Body Diode Reverse Recovery Charge	$Q_{RR}$	—	11.9	—	$\text{nC}$	$I_S = 4.3\text{A}, di/dt = 100\text{A}/\mu\text{s}$

Notes:

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



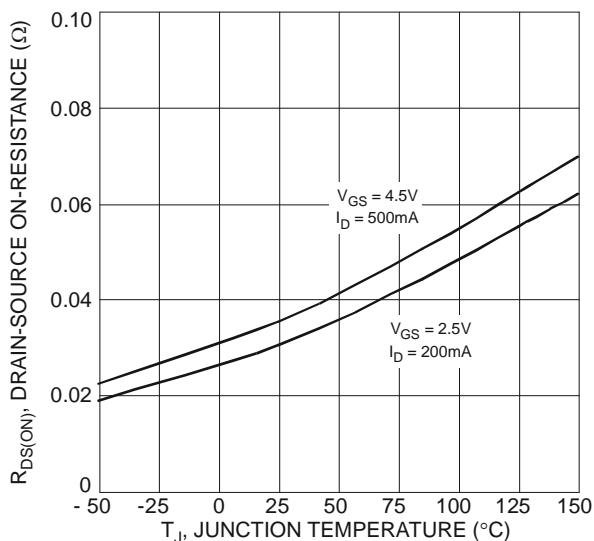


Fig. 7 On-Resistance Variation with Temperature

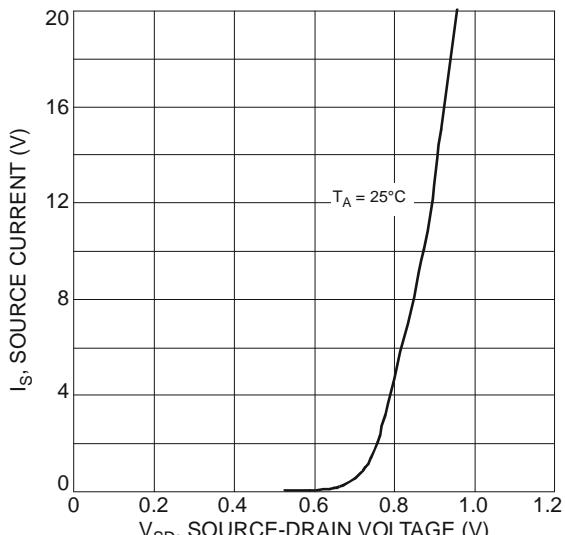


Fig. 9 Diode Forward Voltage vs. Current

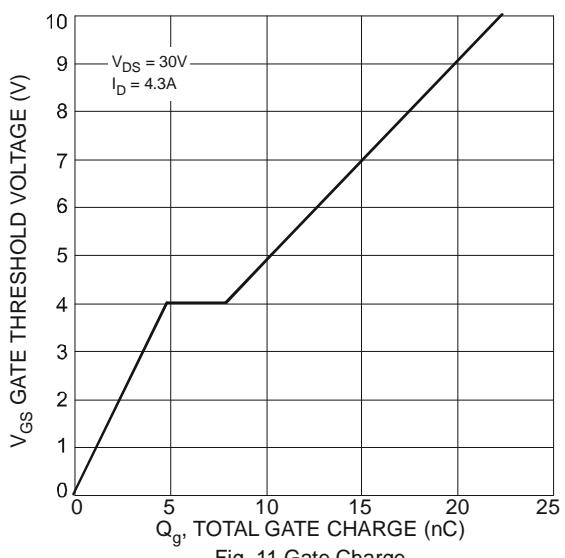


Fig. 11 Gate Charge

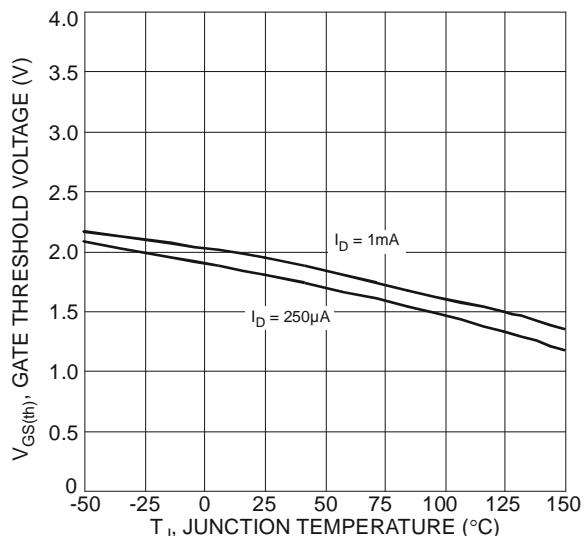


Fig. 8 Gate Threshold Variation vs. Ambient Temperature

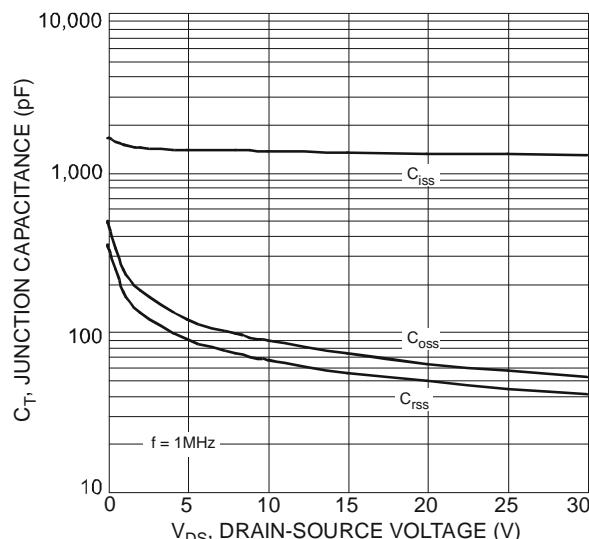


Fig. 10 Typical Junction Capacitance

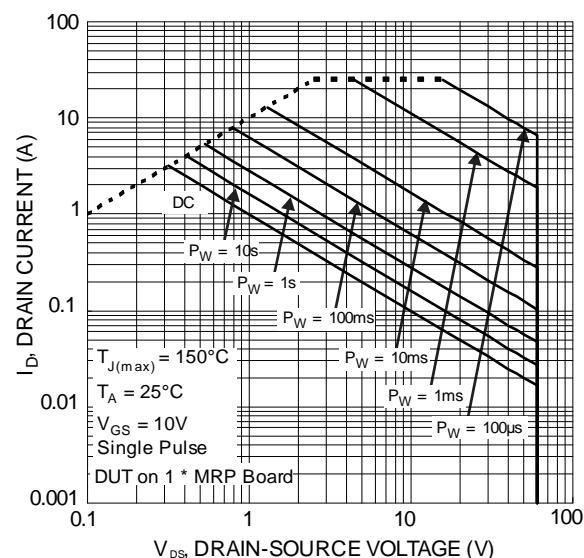


Fig. 12 SOA, Safe Operation Area

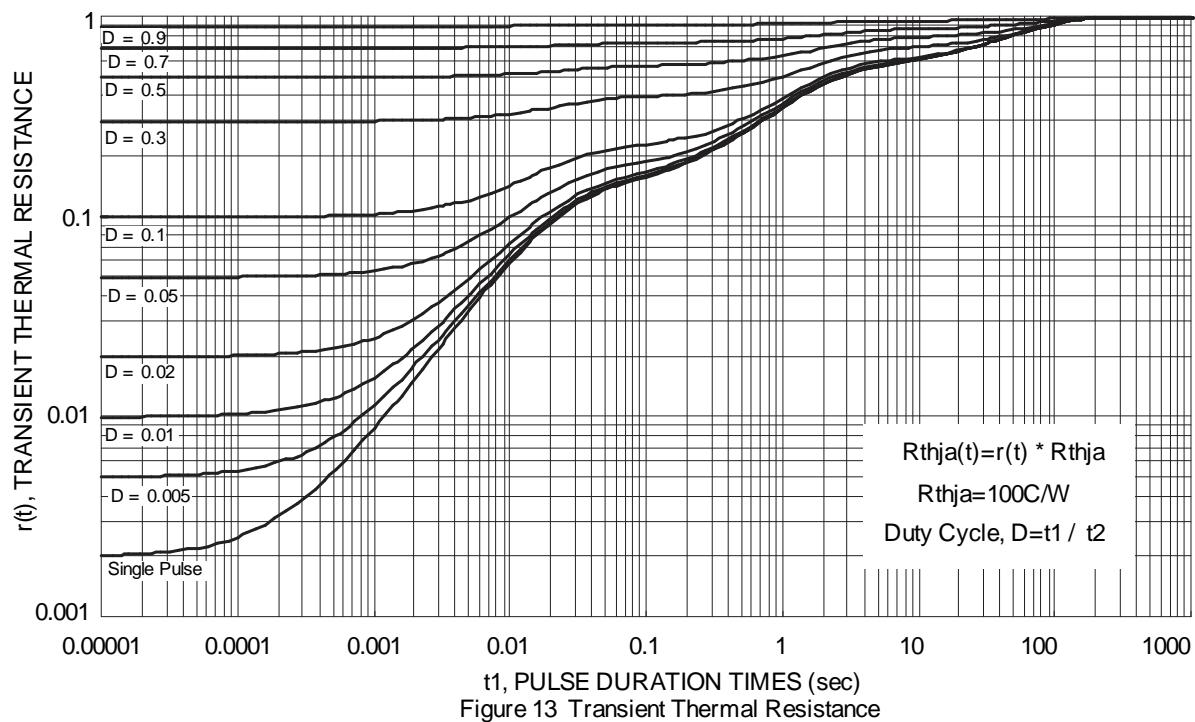
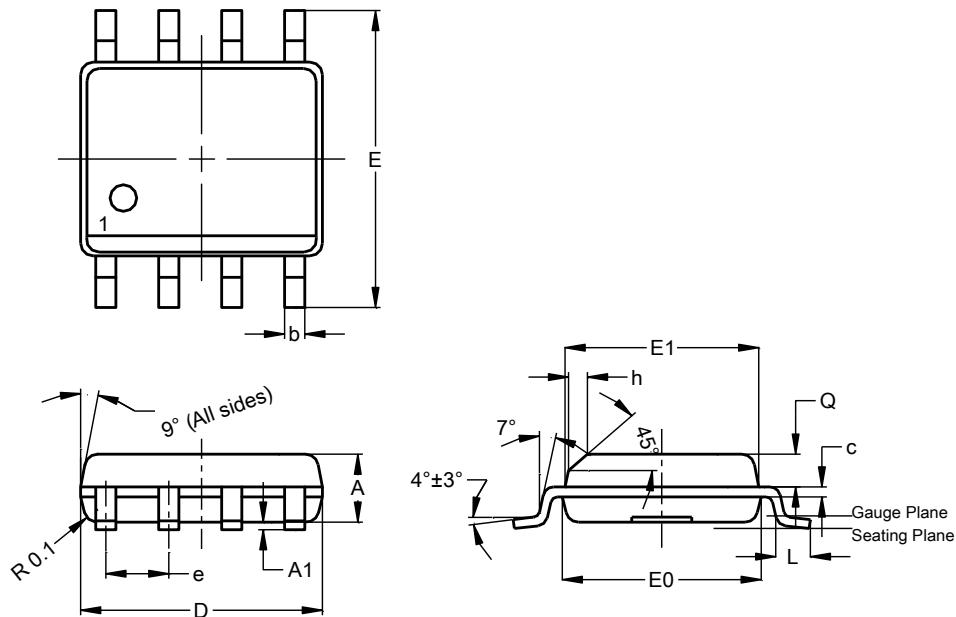


Figure 13 Transient Thermal Resistance

## Package Outline Dimensions

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

SO-8



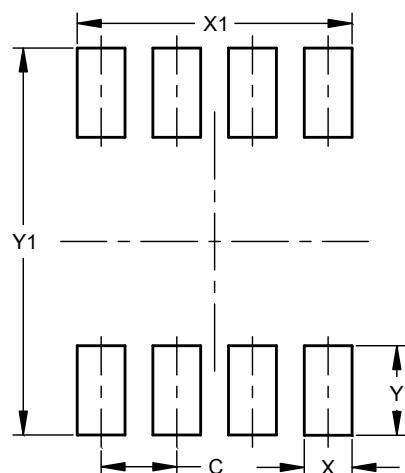
SO-8			
Dim	Min	Max	Typ
<b>A</b>	1.40	1.50	1.45
<b>A1</b>	0.10	0.20	0.15
<b>b</b>	0.30	0.50	0.40
<b>c</b>	0.15	0.25	0.20
<b>D</b>	4.85	4.95	4.90
<b>E</b>	5.90	6.10	6.00
<b>E1</b>	3.80	3.90	3.85
<b>E0</b>	3.85	3.95	3.90
<b>e</b>	--	--	1.27
<b>h</b>	-	--	0.35
<b>L</b>	0.62	0.82	0.72
<b>Q</b>	0.60	0.70	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)
<b>C</b>	1.27
<b>X</b>	0.802
<b>X1</b>	4.612
<b>Y</b>	1.505
<b>Y1</b>	6.50

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