

Product Summary

BV_{DSS}	R_{DSON} Max	I_D Max T_A = +25°C
20V	8mΩ @ V _{GS} = 10V	12.8A
	9mΩ @ V _{GS} = 4.5V	12.1A
	12mΩ @ V _{GS} = 2.5V	10.5A

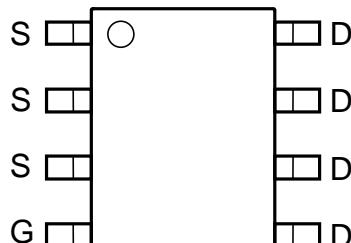
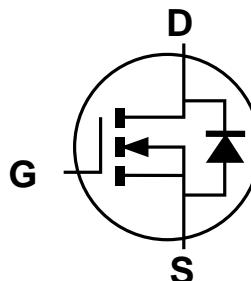
Description and Applications

This MOSFET is designed to minimize the on-state resistance (R_{DSON}) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

- Backlighting
- Power Management Functions
- DC-DC Converters



Top View


 Top View
 Internal Schematic


Equivalent Circuit

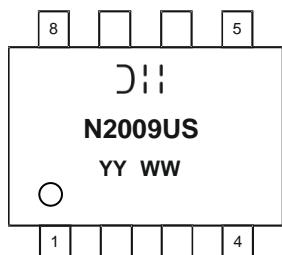
Ordering Information (Note 4)

Part Number	Case	Packaging
DMN2009USS-13	SO-8	2500/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 http://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



DII = Manufacturer's Marking
 N2009US = Product Type Marking Code
 YYWW = Date Code Marking
 YY or YY = Year (ex: 18 = 2018)
 WW = Week (01 to 53)

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

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DSS}	20	V
Gate-Source Voltage			V_{GSS}	± 12	V
Drain Current (Note 6) $V_{GS} = 4.5\text{V}$	Steady State	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	I_D	12.1 9.7	A
Maximum Continuous Body Diode Forward Current (Note 6)			I_S	3	A
Pulsed Drain Current (10 μs Pulse, Duty Cycle = 1%)			I_{DM}	100	A

Thermal Characteristics

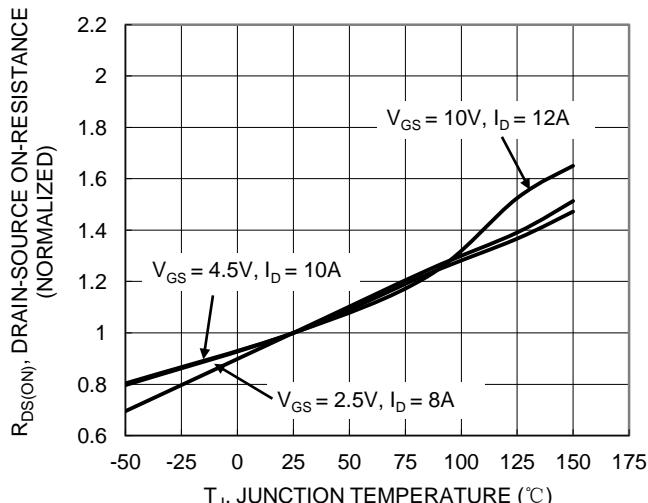
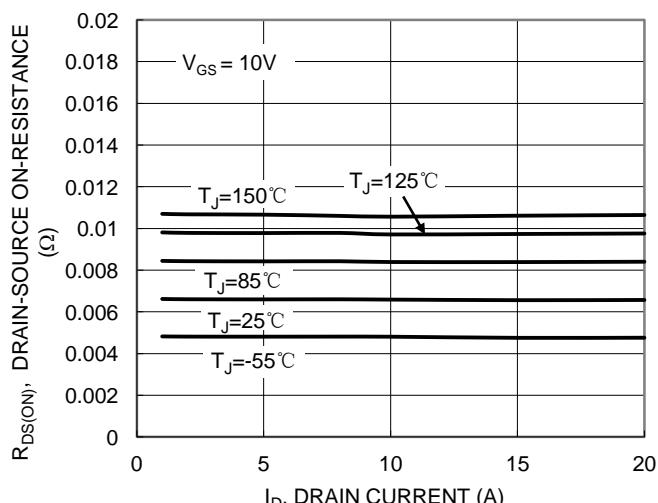
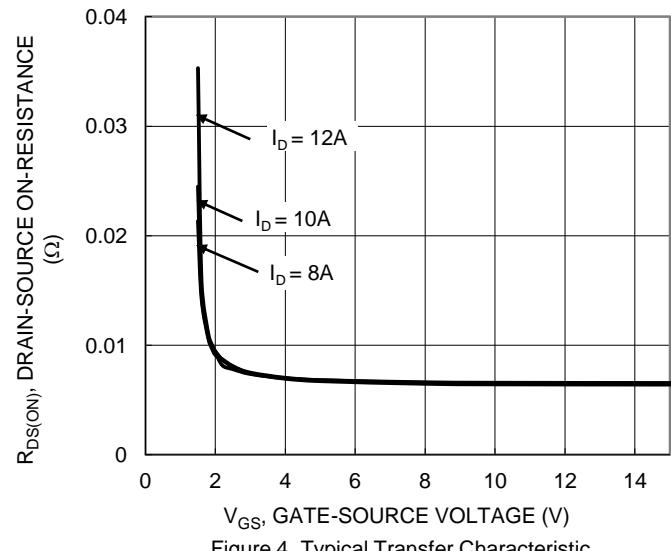
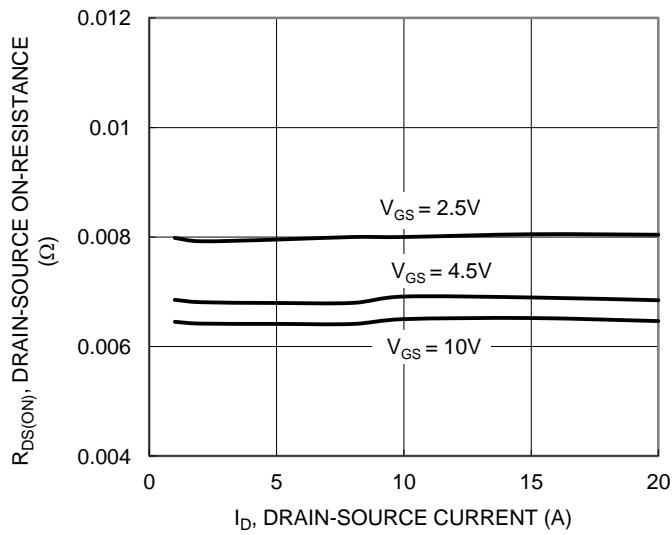
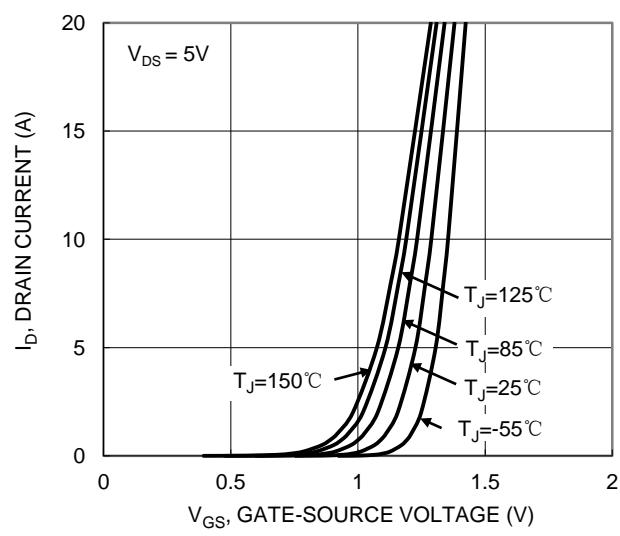
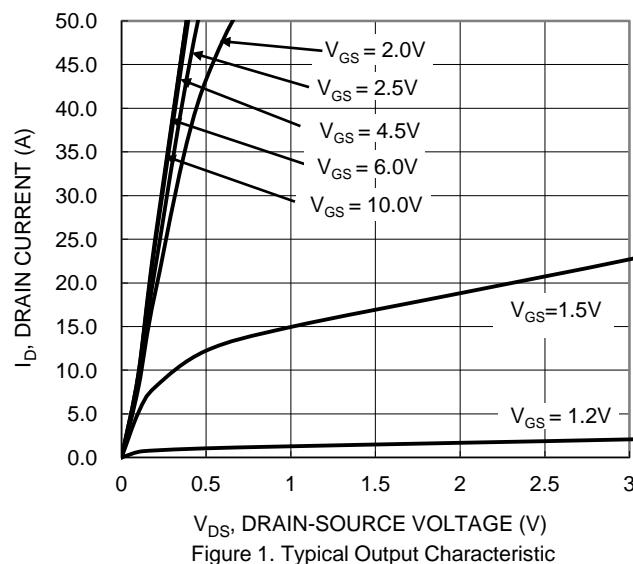
Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 5)	P_D	1.4	W
Thermal Resistance, Junction to Ambient @ $T_A = +25^\circ\text{C}$ (Note 5)	$R_{\theta JA}$	90	°C/W
Total Power Dissipation (Note 6)	P_D	2.0	W
Thermal Resistance, Junction to Ambient @ $T_A = +25^\circ\text{C}$ (Note 6)	$R_{\theta JA}$	63	°C/W
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +150	°C

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 7)						
Drain-Source Breakdown Voltage	BV_{DSS}	20	—	—	V	$V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1	μA	$V_{DS} = 20\text{V}, V_{GS} = 0\text{V}$
Gate-Source Leakage	I_{GSS}	—	—	± 100	nA	$V_{GS} = \pm 12\text{V}, V_{DS} = 0\text{V}$
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	0.5	0.7	1.2	V	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	6.3 6.7 8.7	8 9 12	$\text{m}\Omega$	$V_{GS} = 10\text{V}, I_D = 12\text{A}$ $V_{GS} = 4.5\text{V}, I_D = 10\text{A}$ $V_{GS} = 2.5\text{V}, I_D = 8\text{A}$
Diode Forward Voltage	V_{SD}	0.5	0.63	1.2	V	$V_{GS} = 0\text{V}, I_S = 3\text{A}$
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	1706	—	pF	$V_{DS} = 10\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$
Output Capacitance	C_{oss}	—	383	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	176	—	pF	
Gate Resistance	R_g	—	3.0	—	Ω	$V_{GS} = 0\text{V} V_{DS} = 0\text{V}, f = 1\text{MHz}$
Total Gate Charge ($V_{GS} = 4.5\text{V}$)	Q_g	—	16	—	nC	$V_{DS} = 10\text{V}, I_D = 8.5\text{A}$
Total Gate Charge ($V_{GS} = 10\text{V}$)	Q_g	—	34	—		
Gate-Source Charge	Q_{gs}	—	1.9	—		
Gate-Drain Charge	Q_{gd}	—	4.5	—		
Turn-On Delay Time	$t_{D(ON)}$	—	4.2	—	ns	$V_{DS} = 10\text{V}, I_D = 8.5\text{A}$ $V_{GS} = 4.5\text{V}, R_g = 1.8\Omega$
Turn-On Rise Time	t_R	—	6.2	—	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	—	25	—	ns	
Turn-Off Fall Time	t_F	—	11	—	ns	
Body Diode Reverse Recovery Time	t_{RR}	—	12	—	ns	$I_F = 8.5\text{A}, di/dt = 210\text{A}/\mu\text{s}$
Body Diode Reverse Recovery Charge	Q_{RR}	—	4.7	—	nC	

Notes:

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



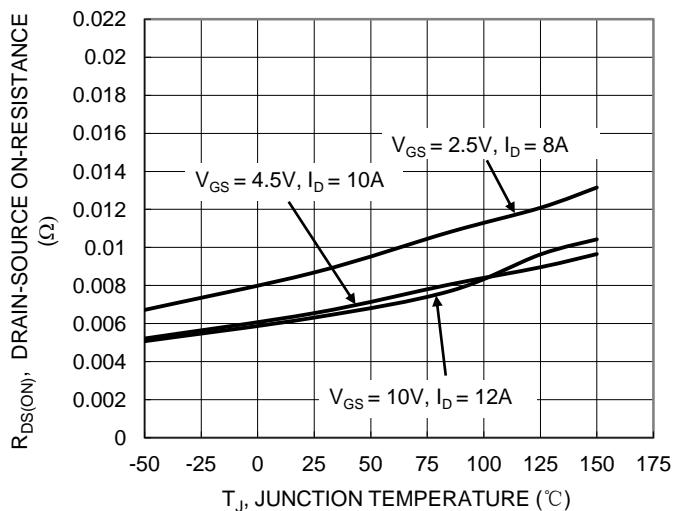


Figure 7. On-Resistance Variation with Junction Temperature

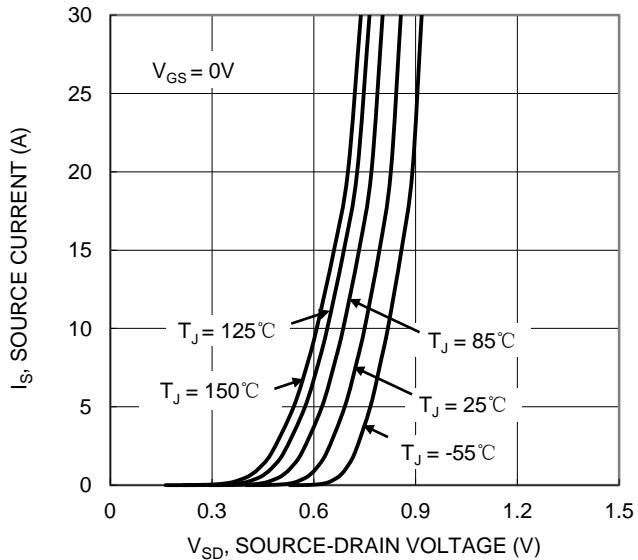


Figure 9. Diode Forward Voltage vs. Current

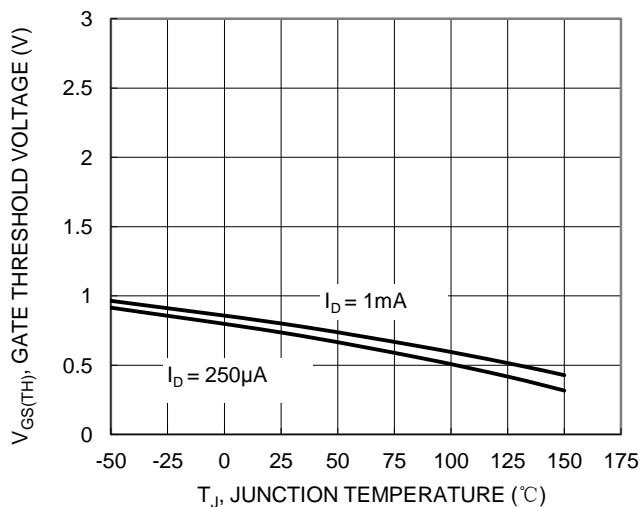


Figure 8. Gate Threshold Variation vs. Junction Temperature

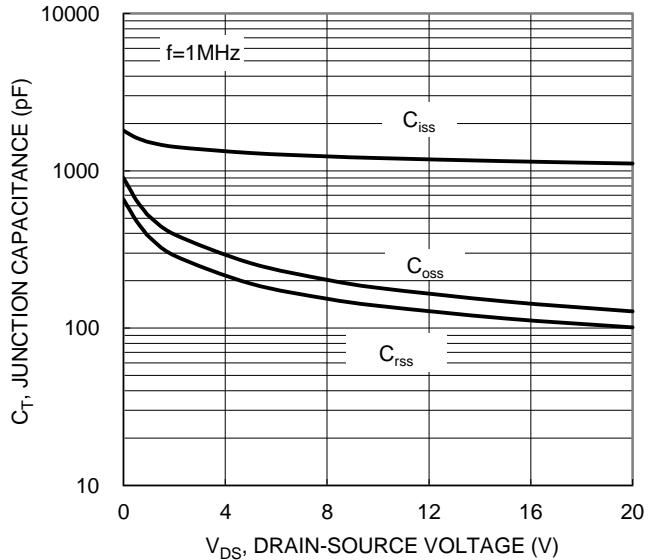


Figure 10. Typical Junction Capacitance

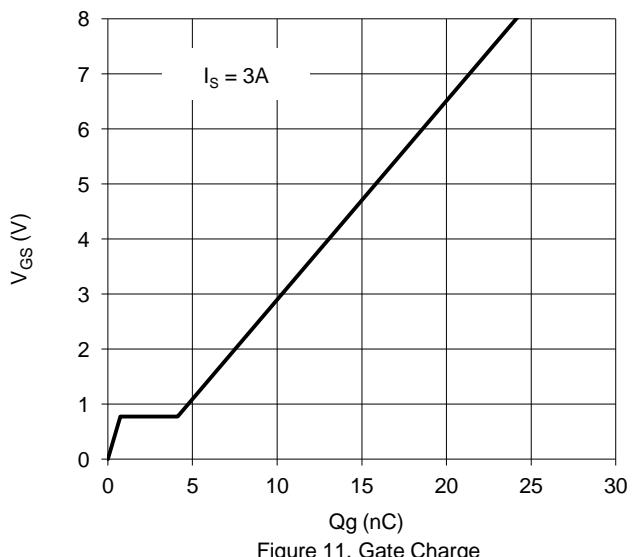


Figure 11. Gate Charge

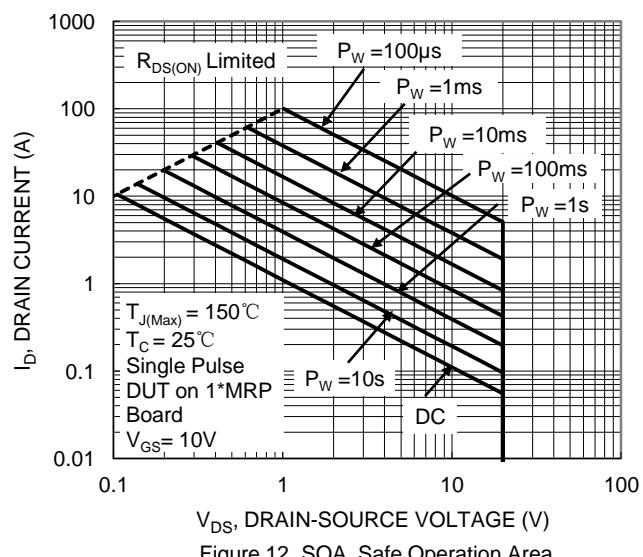


Figure 12. SOA, Safe Operation Area

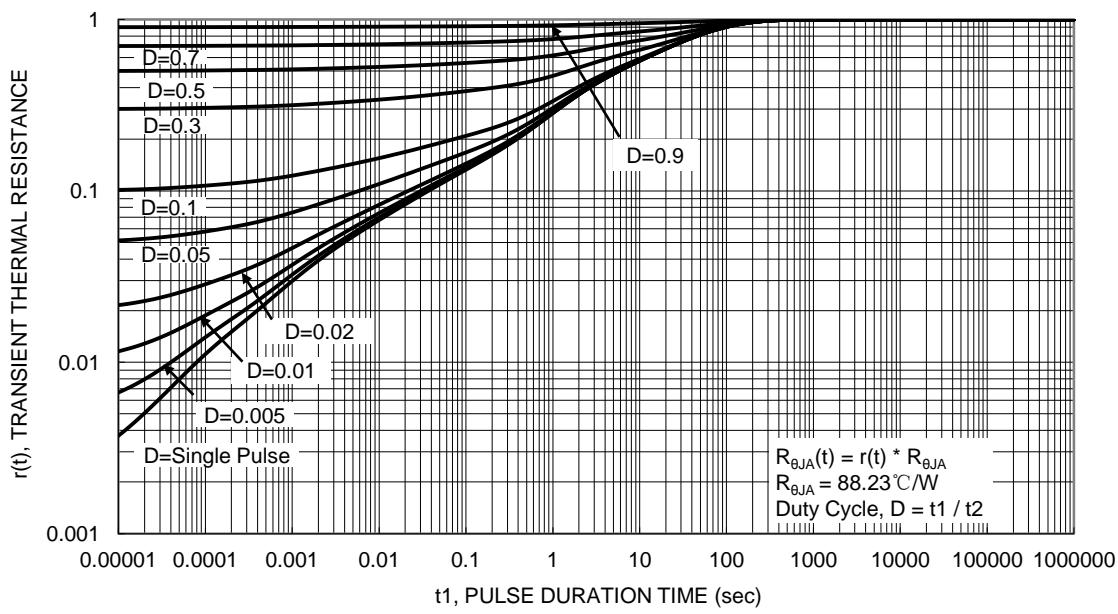
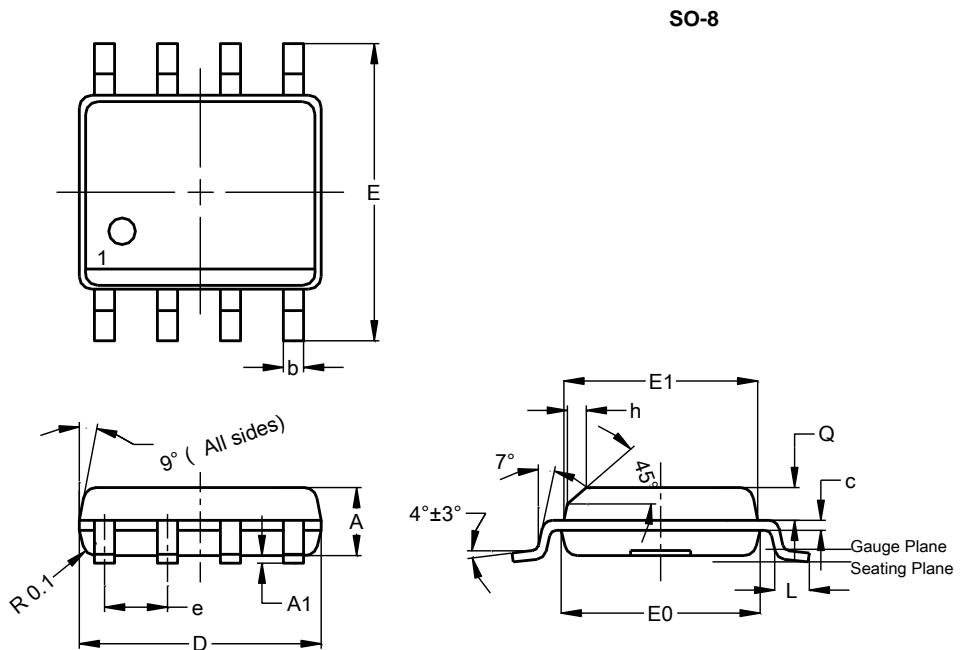


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

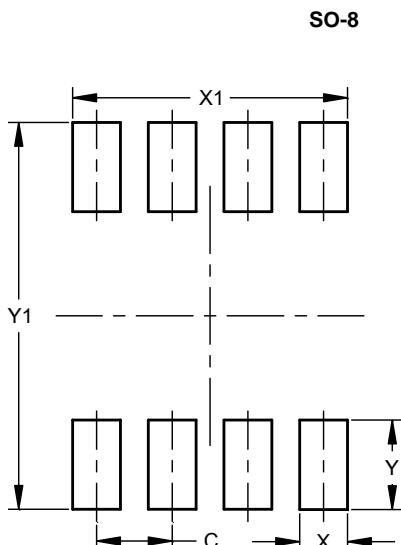
Please see <http://www.diodes.com/package-outlines.html> for the latest version.



SO-8			
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

Suggested Pad Layout

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



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

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