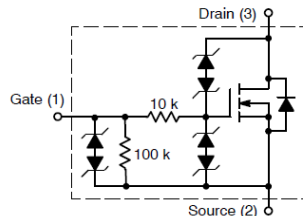
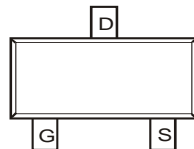


## Product Summary

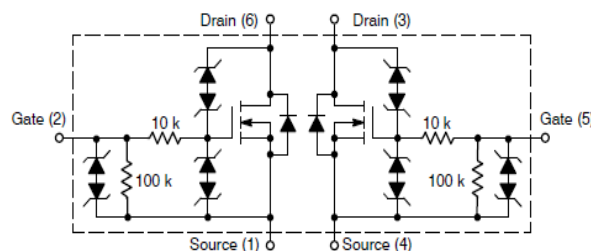
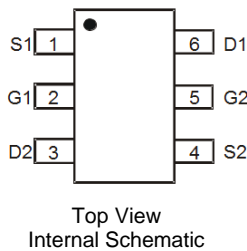
$V_{(BR)DSS}$	$R_{DS(ON) \max}$	$I_D \max$ $T_A = +25^\circ\text{C}$
60V	1.8Ω @ $V_{GS} = 5V$	470mA
	2.4Ω @ $V_{GS} = 3V$	

## Description and Applications

DMN61D8L/LVT provides a single component solution for switching inductive loads such as relays, solenoids, and small DC motors in automotive applications, without the need of a freewheeling diode. DMN61D8L/LVT accepts logic level inputs, thus allowing it to be driven by logic gates, inverters, and microcontrollers. It is ideally suited for doors, windows, and antenna relay coils.



Equivalent Circuit



Top View

Top View  
Internal Schematic

## Ordering Information (Note 4)

Part Number	Case	Packaging
DMN61D8L-7	SOT23	3,000/Tape & Reel
DMN61D8L-13	SOT23	10,000/Tape & Reel
DMN61D8LVT-7	TSOT26	3,000/Tape & Reel
DMN61D8LVT-13	TSOT26	10,000/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>.

## Features and Benefits

- Provides a more reliable and robust interface between sensitive logic and DC relay coils.
- Replaces 3-4 discrete components enabling PCB footprint to be reduced.
- Internal active clamp removes the need for external zener diode.
- **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**

## Mechanical Data

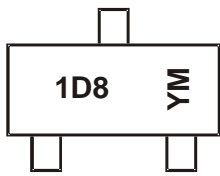
### Case: SOT23

- Case Material: Molded Plastic, "Green" Molding Compound; UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Annealed over Alloy 42 Leadframe. (Lead-Free Plating). Solderable per MIL-STD-202, Method 208@3
- Terminal Connections: See Diagram
- Weight: 0.008 grams (Approximate)

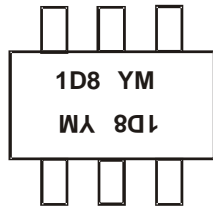
### Case: TSOT26

- Case Material: Molded Plastic, "Green" Molding Compound; UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals Connections: See Diagram
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208@3
- Weight: 0.013 grams (Approximate)

## Marking Information



SOT23



TSOT26

1D8 = Product Type Marking Code  
 YM = Date Code Marking  
 Y or  $\bar{Y}$  = Year (ex: C= 2015)  
 M = Month (ex: 9 = September)

Date Code Key

Year	2014	2015	2016	2017	2018	2019	2020
Code	B	C	D	E	F	G	H

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	O	N	D

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

Characteristic	Symbol	Value	Units
Drain-Source Voltage	V <sub>DSS</sub>	60	V
Gate-Source Voltage	V <sub>GSS</sub>	±12	V
Continuous Drain Current (Note 6) SOT23	I <sub>D</sub>	470 370	mA
Continuous Drain Current (Note 6) TSOT26	I <sub>D</sub>	630 500	mA
Maximum Continuous Body Diode Forward Current (Note 6)	I <sub>S</sub>	0.5	A
Single Pulse Drain-to-Source Avalanche Energy (for relay coils/inductive loads of 80Ω or higher) (T <sub>J</sub> initial = +85°C)	E <sub>Z</sub>	200	mJ
Peak Power Dissipation, Drain-to-Source (non-repetitive current square pulse 1.0 ms duration) (T <sub>J</sub> initial = +85°C)	P <sub>PK</sub>	20	W
Load Dump Pulse, Drain-to-Source, R <sub>SOURCE</sub> = 0.5Ω, T = 300 ms (for relay coils/inductive loads of 80Ω or higher) (T <sub>J</sub> Initial = +85°C)	ELD1	60	V
Inductive Switching Transient 1, Drain-to-Source (Waveform: R <sub>SOURCE</sub> = 10Ω, T = 2.0 ms) (for relay coils/inductive loads of 80Ω or higher) (T <sub>J</sub> Initial = +85°C)	ELD2	100	V
Inductive Switching Transient 2, Drain-to-Source (Waveform: R <sub>SOURCE</sub> = 4.0Ω, T = 50 μs) (for relay coils/inductive loads of 80Ω or higher) (T <sub>J</sub> Initial = +85°C)	ELD3	300	V
Reverse Battery, 10 Minutes (Drain-to-Source) (for relay coils/inductive loads of 80Ω or higher)	Rev-Bat	-14	V
Dual Voltage Jump Start, 10 Minutes (Drain-to-Source)	Dual-Volt	28	V
ESD Human Body Model (HBM)	ESD	4,000	V

**Thermal Characteristics (SOT23)** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Units
Total Power Dissipation (Note 5)	P <sub>D</sub>	390	mW
Thermal Resistance, Junction to Ambient (Note 5)	Steady State R <sub>θJA</sub>	321	°C/W
Total Power Dissipation (Note 6)	P <sub>D</sub>	610	mW
Thermal Resistance, Junction to Ambient (Note 6)	Steady State R <sub>θJA</sub>	208	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

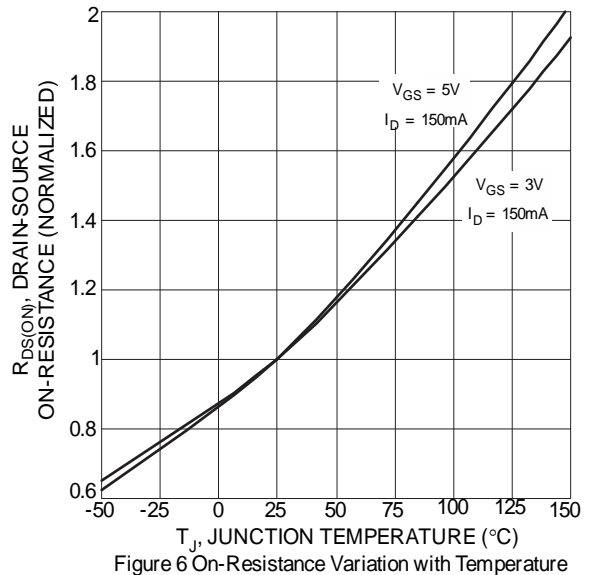
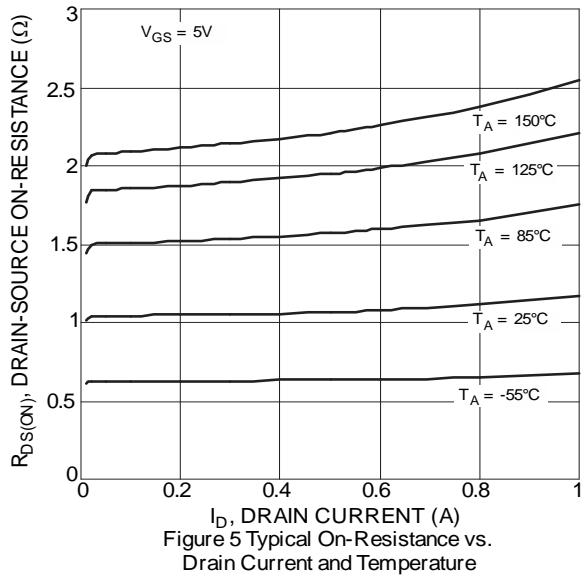
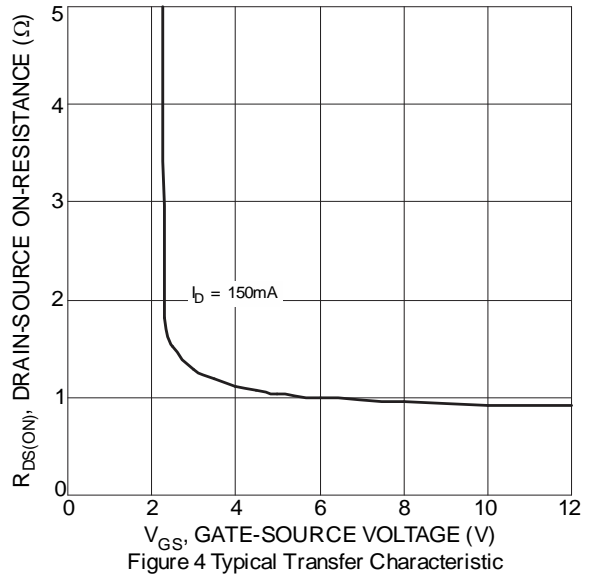
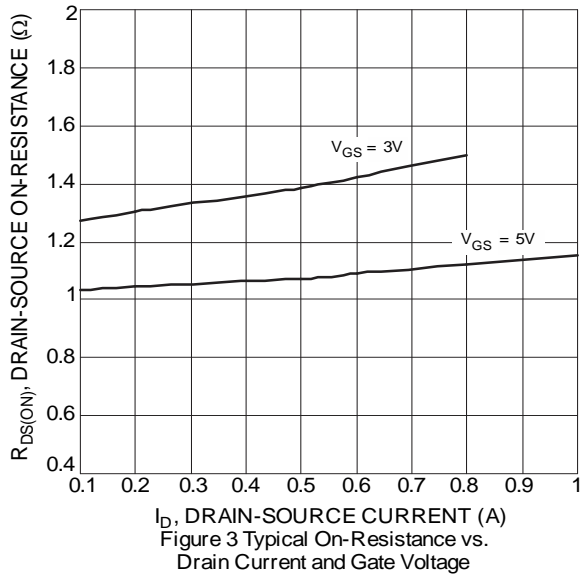
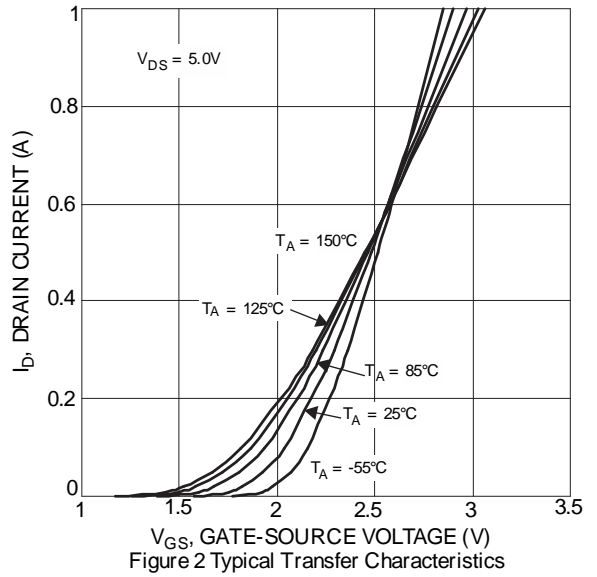
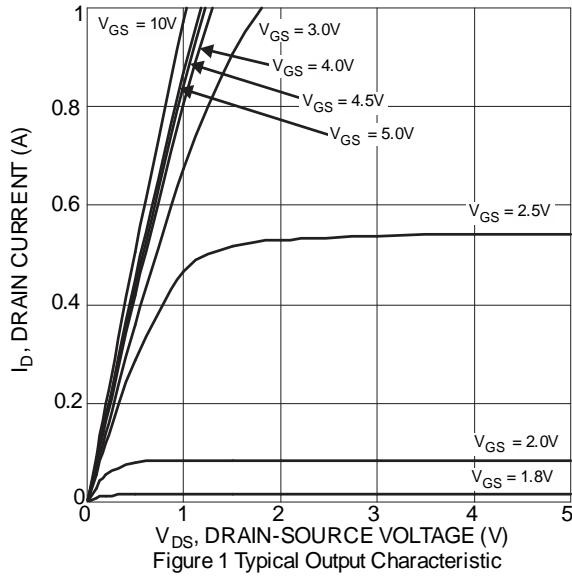
**Thermal Characteristics (TSOT26)** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Units
Total Power Dissipation (Note 5)	P <sub>D</sub>	820	mW
Thermal Resistance, Junction to Ambient (Note 5)	Steady State R <sub>θJA</sub>	154	°C/W
Total Power Dissipation (Note 6)	P <sub>D</sub>	1090	mW
Thermal Resistance, Junction to Ambient (Note 6)	Steady State R <sub>θJA</sub>	116	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 7)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	60	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 10mA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	50 0.5	μA	V <sub>DS</sub> = 60V, V <sub>GS</sub> = 0V V <sub>DS</sub> = 12V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±90 ±60	μA	V <sub>GS</sub> = ±5V, V <sub>DS</sub> = 0V V <sub>GS</sub> = ±3V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 7)</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	1.3	—	2.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 1mA
Static Drain-Source On-Resistance	R <sub>DS(on)</sub>	—	1.1 1.4	1.8 2.4	Ω	V <sub>GS</sub> = 5V, I <sub>D</sub> = 0.15A V <sub>GS</sub> = 3V, I <sub>D</sub> = 0.15A
Forward Transfer Admittance	Y <sub>fs</sub>	80	—	—	ms	V <sub>DS</sub> = 12V, I <sub>D</sub> = 0.15A
Diode Forward Voltage	V <sub>SD</sub>	—	—	1.2	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 0.15A
<b>DYNAMIC CHARACTERISTICS (Note 8)</b>						
Input Capacitance	C <sub>iss</sub>	—	12.9	—	pF	V <sub>DS</sub> = 12V, V <sub>GS</sub> = 0V f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	—	17	—	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>	—	0.84	—	pF	
Total Gate Charge	Q <sub>g</sub>	—	0.74	—	nC	V <sub>GS</sub> = 5V, V <sub>DS</sub> = 12V, I <sub>D</sub> = 150mA
Gate-Source Charge	Q <sub>gs</sub>	—	0.19	—	nC	
Gate-Drain Charge	Q <sub>gd</sub>	—	0.16	—	nC	
Turn-On Delay Time	t <sub>D(on)</sub>	—	131	—	ns	V <sub>DD</sub> = 12V, V <sub>GS</sub> = 5V.
Turn-On Rise Time	t <sub>r</sub>	—	301	—	ns	
Turn-Off Delay Time	t <sub>D(off)</sub>	—	582	—	ns	
Turn-Off Fall Time	t <sub>f</sub>	—	440	—	ns	

- Notes:
- Device mounted on FR-4 PCB, with minimum recommended pad layout.
  - Device mounted on 1" x 1" FR-4 PCB with high coverage 2oz. copper, single sided.
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to product testing.



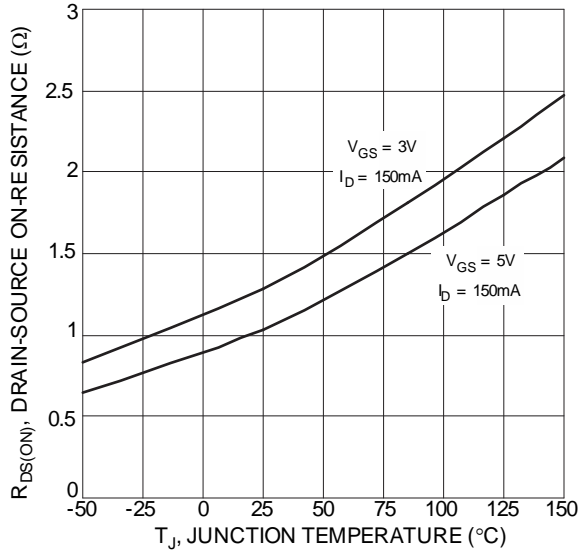


Figure 7 On-Resistance Variation with Temperature

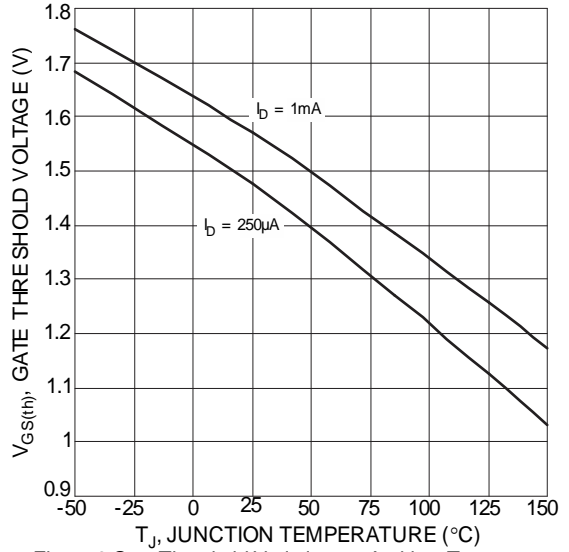


Figure 8 Gate Threshold Variation vs. Ambient Temperature

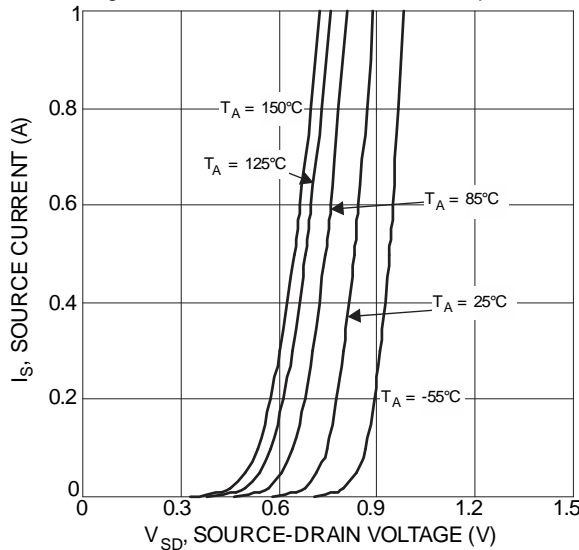


Figure 9 Diode Forward Voltage vs. Current

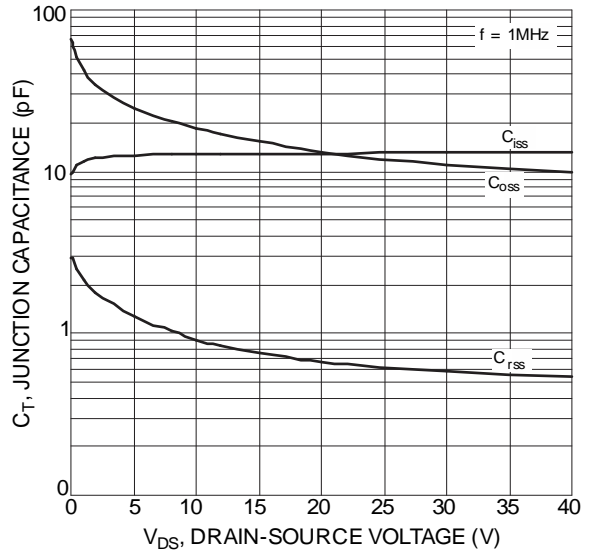


Figure 10 Typical Junction Capacitance

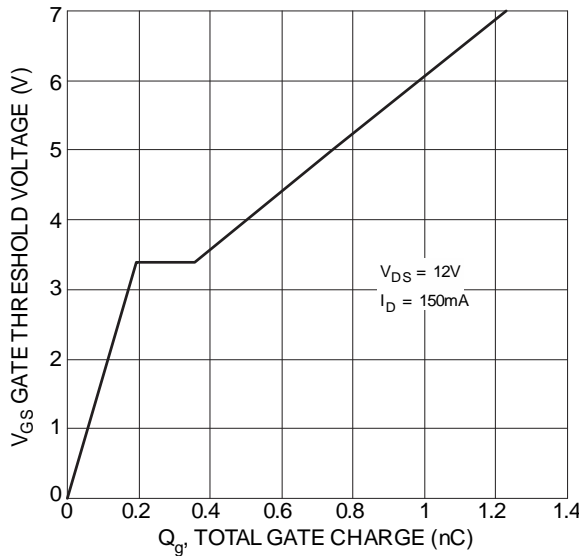


Figure 11 Gate Charge

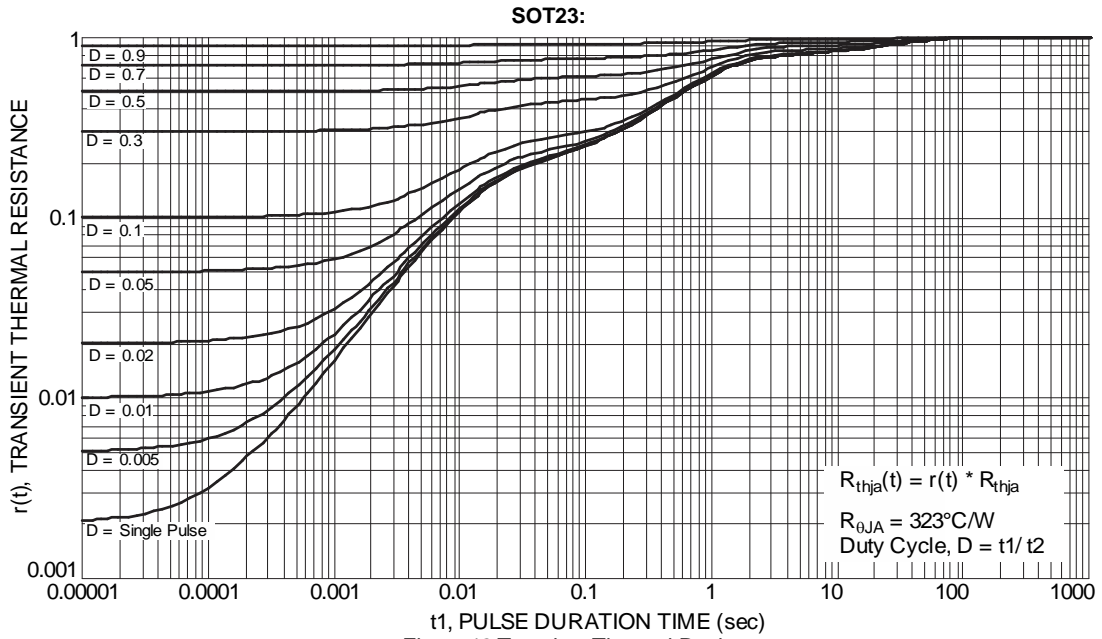


Figure 12 Transient Thermal Resistance

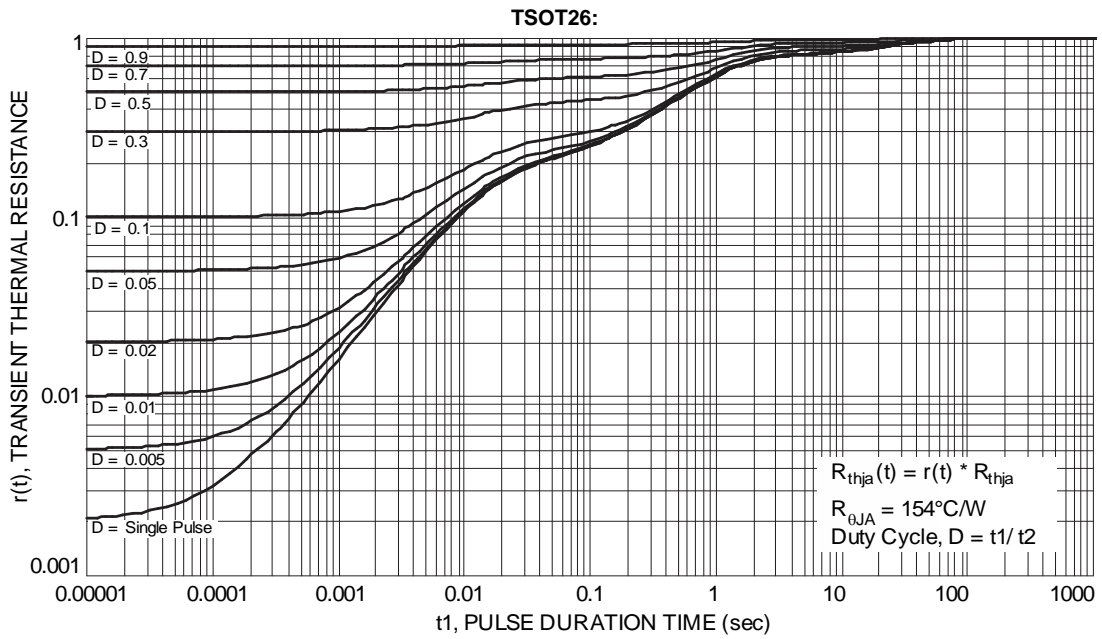
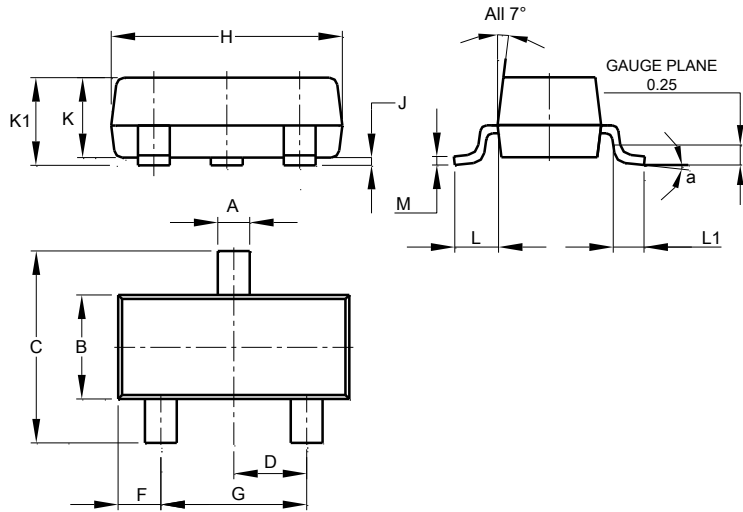


Figure 13 Transient Thermal Resistance

**Package Outline Dimensions**

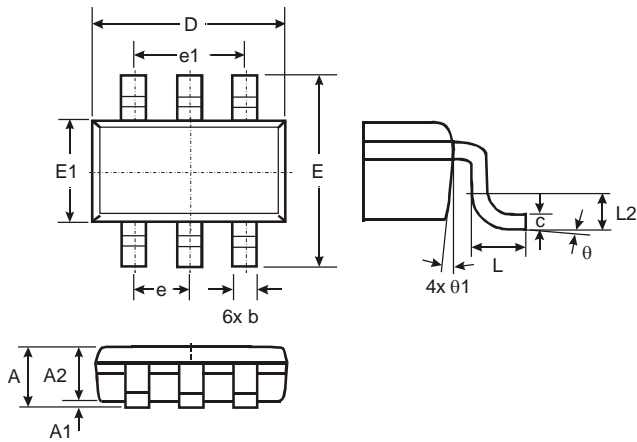
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.

**SOT23**



SOT23			
Dim	Min	Max	Typ
A	0.37	0.51	0.40
B	1.20	1.40	1.30
C	2.30	2.50	2.40
D	0.89	1.03	0.915
F	0.45	0.60	0.535
G	1.78	2.05	1.83
H	2.80	3.00	2.90
J	0.013	0.10	0.05
K	0.890	1.00	0.975
K1	0.903	1.10	1.025
L	0.45	0.61	0.55
L1	0.25	0.55	0.40
M	0.085	0.150	0.110
α	8°		
All Dimensions in mm			

**TSOT26**

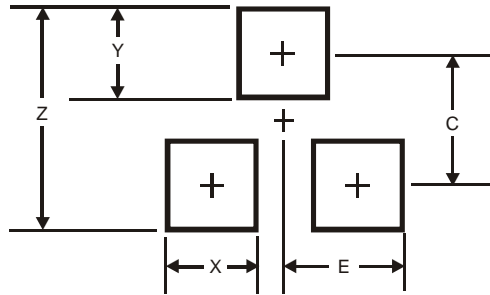


TSOT26			
Dim	Min	Max	Typ
A	-	1.00	-
A1	0.01	0.10	-
A2	0.84	0.90	-
D	-	-	2.90
E	-	-	2.80
E1	-	-	1.60
b	0.30	0.45	-
c	0.12	0.20	-
e	-	-	0.95
e1	-	-	1.90
L	0.30	0.50	-
L2	-	-	0.25
θ	0°	8°	4°
θ1	4°	12°	-
All Dimensions in mm			

**Suggested Pad Layout**

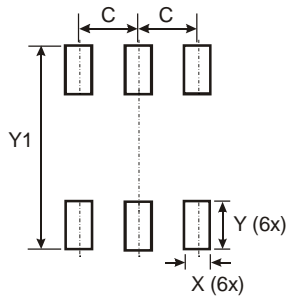
Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.

**SOT23**



Dimensions	Value (in mm)
Z	2.9
X	0.8
Y	0.9
C	2.0
E	1.35

**TSOT26**



Dimensions	Value (in mm)
C	0.950
X	0.700
Y	1.000
Y1	3.199



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