INTEGRATED RELAY AND INDUCTIVE LOAD DRIVER

Product Summary

BV_{DSS}	$R_{DS(ON)}$ Max	I_D Max T_A = +25°C
60V	1.8Ω @ V_{GS} = 5V	470mA
	2.4Ω @ V_{GS} = 3V	

Features and Benefits

- Provides A More Reliable And Robust Interface Between Sensitive Logic And DC Relay Coils
- Replaces 3 to 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**
- **PPAP Capable (Note 4)**

Description and Applications

The DMN61D8LQ 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. DMN61D8LQ accepts logic level inputs, thus allowing it to be driven by logic gates, inverters, and microcontrollers.

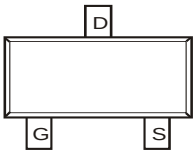
Mechanical Data

- Case: SOT23
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish Annealed over Alloy 42 Leadframe (Lead-Free Plating). Solderable per MIL-STD-202, Method 208 e3
- Terminal Connections: See Diagram
- Weight: 0.008 grams (Approximate)

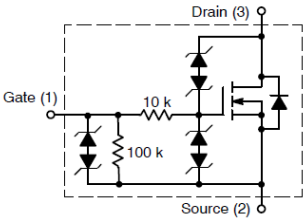
ESD protected

Top View

SOT23



Top View
Internal Schematic



Equivalent Circuit

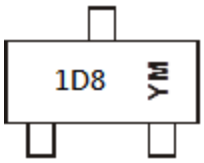
Ordering Information (Note 5)

Part Number	Case	Packaging
DMN61D8LQ-7	SOT23	3,000/Tape & Reel
DMN61D8LQ-13	SOT23	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 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.
5. For packaging details, go to our website at http://www.diodes.com/products/packages.html.

Marking Information

SOT23



1D8 = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: D= 2016)
M = Month (ex: 9 = September)

Date Code Key

Year	2016	2017	2018	2019	2020	2021	2022
Code	D	E	F	G	H	I	J

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_A = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DSS}	60	V
Gate-Source Voltage			V_{GSS}	±12	V
Continuous Drain Current (Note 7)	Steady State	T_A = +25°C T_A = +70°C	I_D	470 370	mA
Maximum Continuous Body Diode Forward Current (Note 6)			I_S	0.5	A
Single Pulse Drain−to−Source Avalanche Energy (For Relay's Coils/Inductive Loads of 80Ω or Higher) (T_J Initial = +85°C)			E_Z	200	mJ
Peak Power Dissipation, Drain−to−Source (Non repetitive current square pulse 1.0ms duration) (T_J Initial = +85°C)			P_{PK}	20	W
Load Dump Pulse, Drain−to−Source, R_{SOURCE} = 0.5Ω, t = 300ms) (For Relay's Coils/Inductive Loads of 80Ω or Higher) (T_J Initial = +85°C)			E_{LD1}	60	V
Inductive Switching Transient 1, Drain−to−Source (Waveform: R_{SOURCE} = 10Ω, t = 2.0ms) (For Relay's Coils/Inductive Loads of 80Ω or Higher) (T_J Initial = +85°C)			E_{LD2}	100	V
Inductive Switching Transient 2, Drain−to−Source (Waveform: R_{SOURCE} = 4.0Ω, t = 50µs) (For Relay's Coils/Inductive Loads of 80Ω or Higher) (T_J Initial = +85°C)			E_{LD3}	300	V
Reverse Battery, 10 Minutes (Drain−to−Source) (For Relay's Coils/Inductive Loads of 80Ω or more)			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

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 6)		P_D	390	mW
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	321	°C/W
Total Power Dissipation (Note 7)		P_D	610	mW
Thermal Resistance, Junction to Ambient (Note 7)	Steady State	$R_{\theta JA}$	208	°C/W
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

Notes: 6. Device mounted on FR-4 PCB, with minimum recommended pad layout.
7. Device mounted on 1" x 1" FR-4 PCB with high coverage 2oz. copper, single sided.

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 8)						
Drain-Source Breakdown Voltage	BV_{DSS}	60	—	—	V	V_{GS} = 0V, I_D = 10mA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	50 0.5	μA	V_{DS} = 60V, V_{GS} = 0V V_{DS} = 12V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±90 ±60	μA	V_{GS} = ±5V, V_{DS} = 0V V_{GS} = ±3V, V_{DS} = 0V
ON CHARACTERISTICS (Note 8)						
Gate Threshold Voltage	$V_{GS(TH)}$	1.3	—	2.0	V	V_{DS} = V_{GS}, I_D = 1mA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	1.1 1.4	1.8 2.4	Ω	V_{GS} =5V, I_D = 0.15A V_{GS} = 3V, I_D = 0.15A
Forward Transfer Admittance	$\|Y_{fs}\|$	80	—	—	ms	V_{DS} =12V, I_D = 0.15A
Diode Forward Voltage	V_{SD}	—	—	1.2	V	V_{GS} = 0V, I_S = 0.15A
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{iss}	—	12.9	—	pF	V_{DS} = 12V, V_{GS} = 0V f = 1.0MHz
Output Capacitance	C_{oss}	—	17	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	0.84	—	pF	
Total Gate Charge	Q_g	—	0.74	—	nC	V_{GS} = 5V, V_{DS} = 12V, I_D =150mA
Gate-Source Charge	Q_{gs}	—	0.19	—	nC	
Gate-Drain Charge	Q_{gd}	—	0.16	—	nC	
Turn-On Delay Time	$t_{D(ON)}$	—	131	—	ns	V_{DD} = 12V, V_{GS} = 5V.
Turn-On Rise Time	t_R	—	301	—	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	—	582	—	ns	
Turn-Off Fall Time	t_F	—	440	—	ns	

Notes: 8. Short duration pulse test used to minimize self-heating effect.
9. Guaranteed by design. Not subject to product testing.

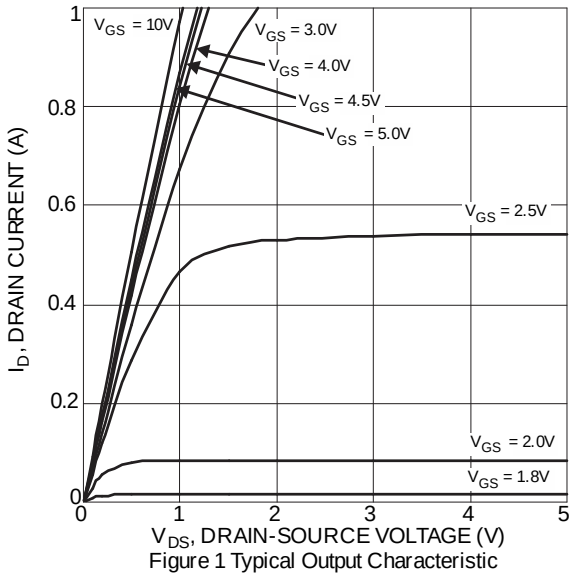


Figure 1 Typical Output Characteristic

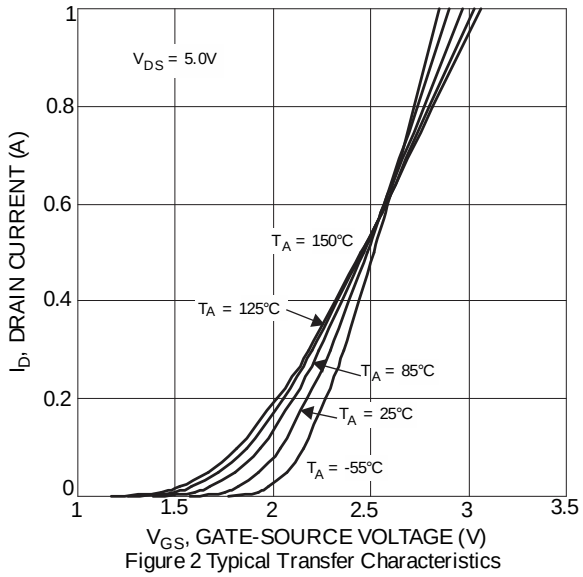


Figure 2 Typical Transfer Characteristics

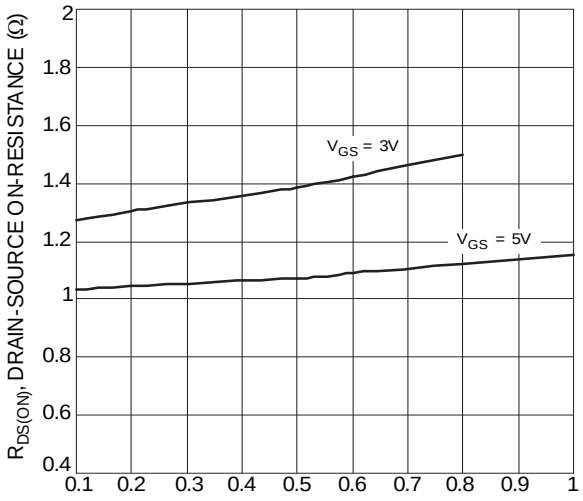


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

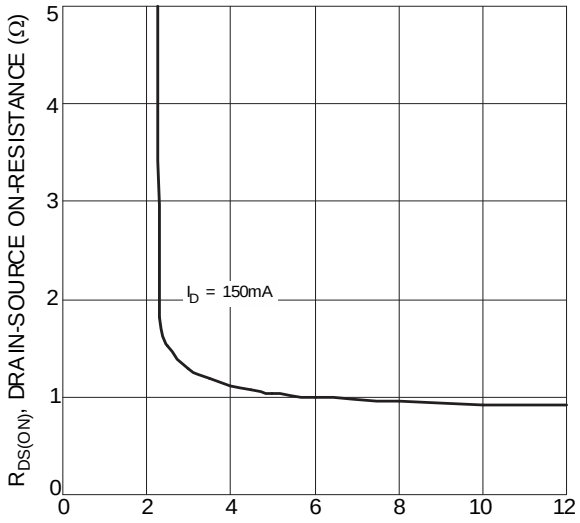


Figure 4 Typical Transfer Characteristic

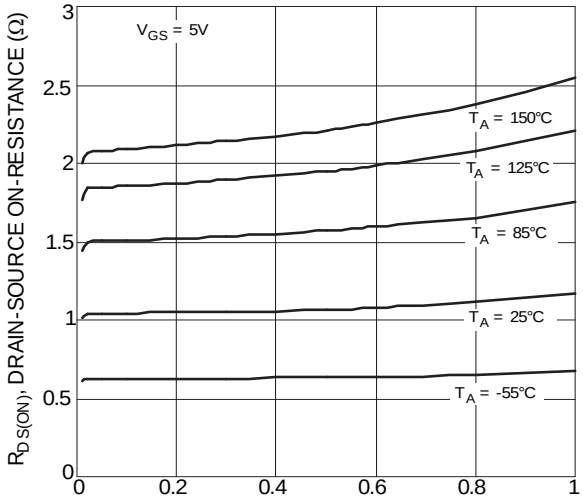


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

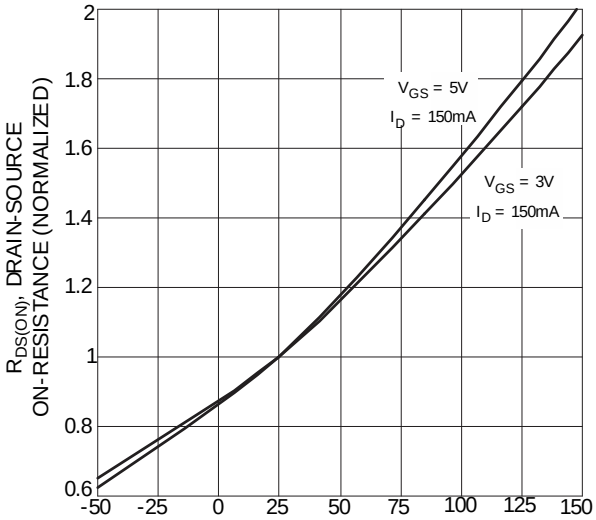


Figure 6 On-Resistance Variation with Temperature

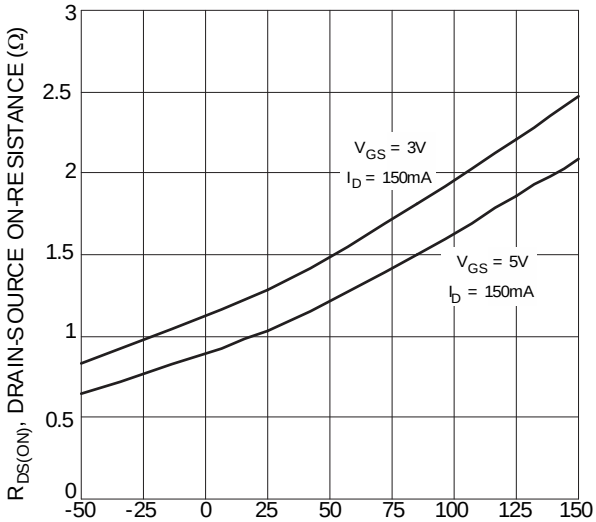


Figure 7 On-Resistance Variation with Temperature

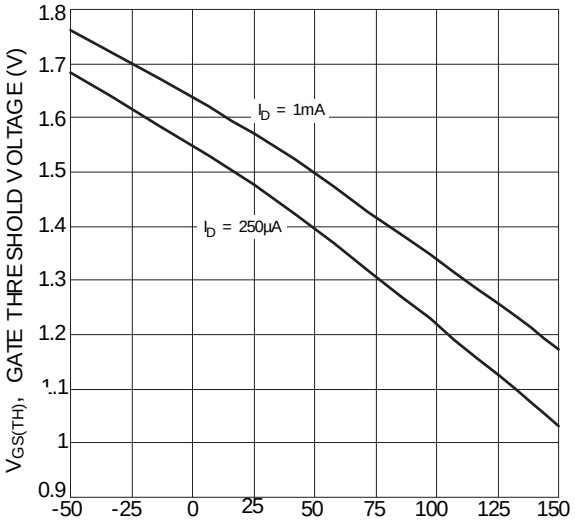


Figure 8 Gate Threshold Variation vs.Junction Temperature

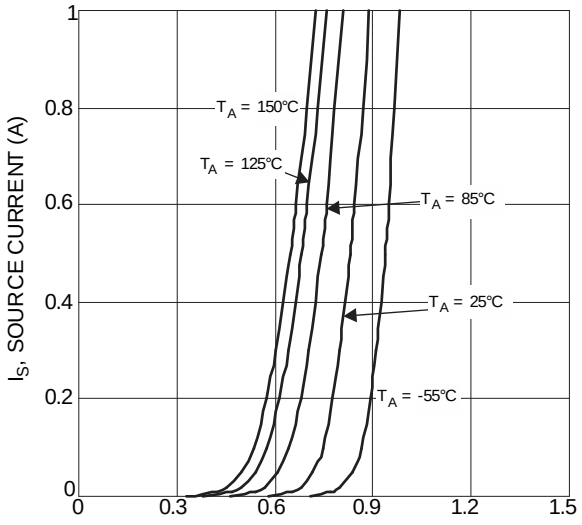


Figure 9 Diode Forward Voltage vs. Current

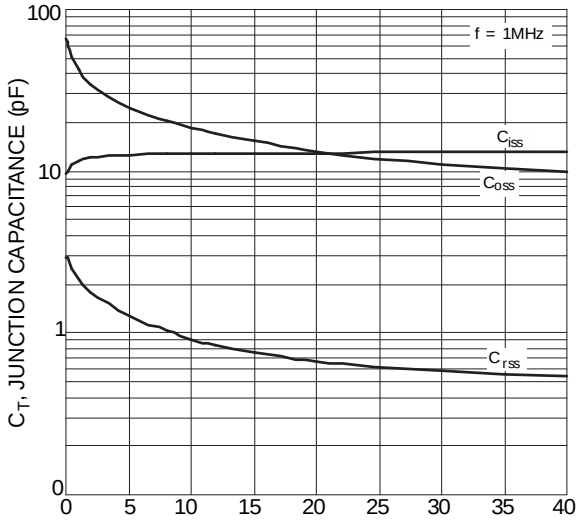


Figure 10 Typical Junction Capacitance

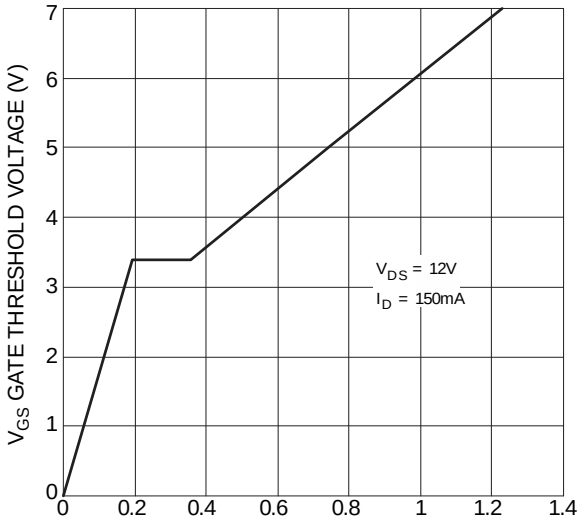


Figure 11 Gate Charge

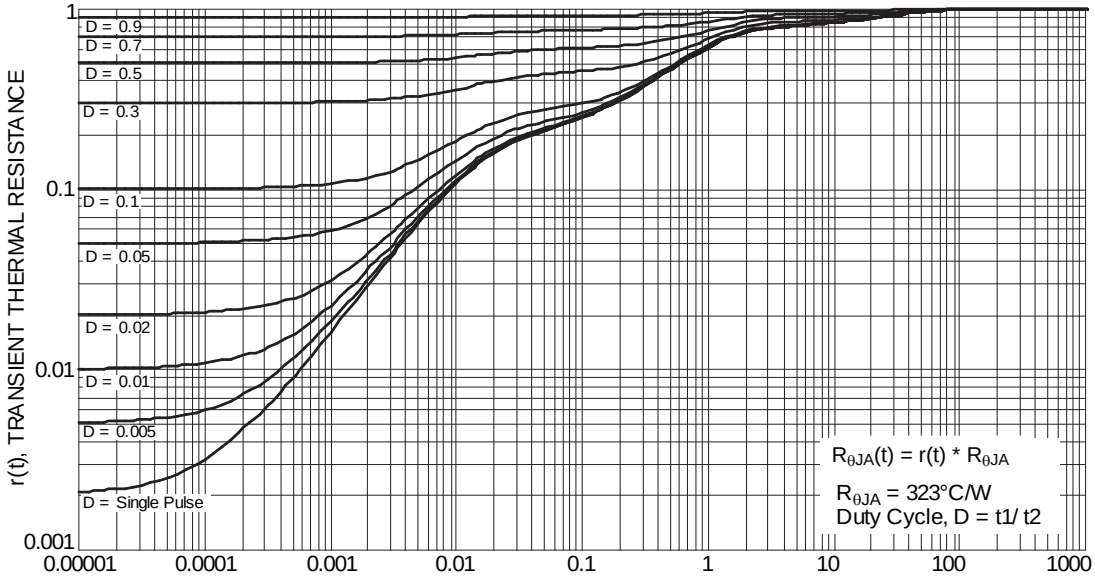
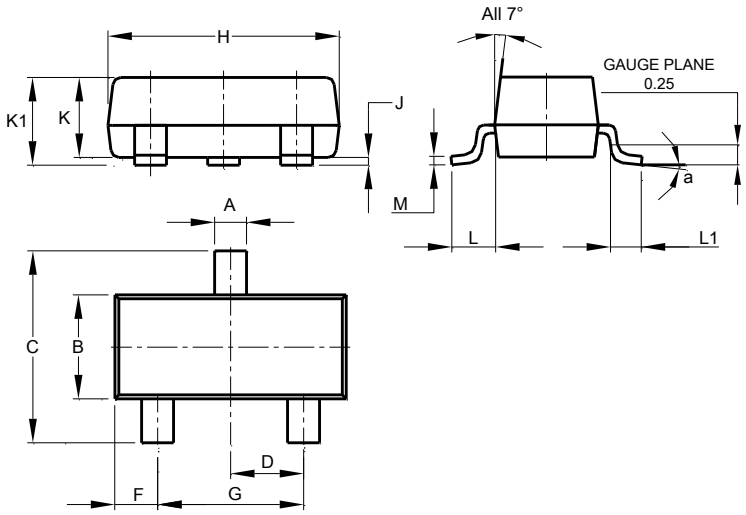


Figure 12 Transient Thermal Resistance

Package Outline Dimensions

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

SOT23

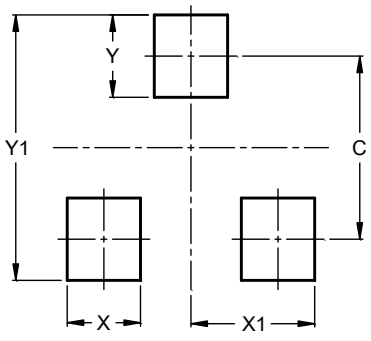


SOT23			
Dim	**Min**	**Max**	**Typ**
A	0.37	0.51	0.40
B	1.20	1.40	1.30
C	2.30	2.50	2.40
D	0.89	1.03	0.915
F	0.45	0.60	0.535
G	1.78	2.05	1.83
H	2.80	3.00	2.90
J	0.013	0.10	0.05
K	0.890	1.00	0.975
K1	0.903	1.10	1.025
L	0.45	0.61	0.55
L1	0.25	0.55	0.40
M	0.085	0.150	0.110
a	0°	8°	--
All Dimensions in mm			

Suggested Pad Layout

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

SOT23



Dimensions	Value (in mm)
C	2.0
X	0.8
X1	1.35
Y	0.9
Y1	2.9

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