N-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$	I_D T_A = 25°C
40V	30mΩ @ V_{GS} = 10V	13.8A
	54mΩ @ V_{GS} = 4.5V	10.3A

Features and Benefits

- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- **Lead Free By Design/RoHS Compliant (Note 1)**
- **"Green" Device (Note 2)**
- **Qualified to AEC-Q101 Standards for High Reliability**

Description and Applications

This new generation MOSFET has been 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.

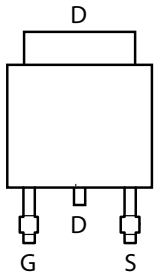
- Backlighting
- DC-DC Converters
- Power management functions

Mechanical Data

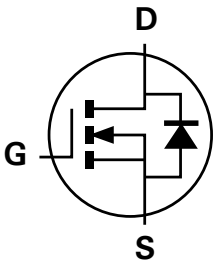
- Case: TO252-3L
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram Below
- Weight: 0.33 grams (approximate)

TO252-3L

Top View



Top View
Pin-Out



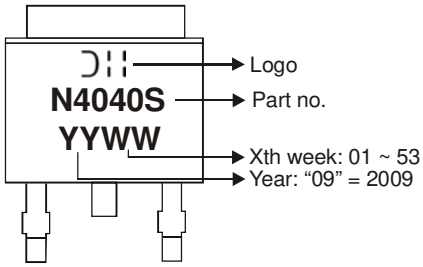
Equivalent Circuit

Ordering Information (Note 3)

Part Number	Case	Packaging
DMN4040SK3-13	TO252-3L	2500 / Tape & Reel

Notes:
1. No purposefully added lead.
2. Diodes Inc.'s "Green" policy can be found on our website at http://www.diodes.com.
3. For packaging details, go to our website at http://www.diodes.com.

Marking Information



Maximum Ratings @T_A = 25°C unless otherwise specified

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DSS}	40	V
Gate-Source Voltage			V_{GSS}	±20	V
Continuous Drain Current (Note 4) V_{GS} = 10V	Steady State	T_A = 25°C T_A = 70°C	I_D	6.0 4.8	A
Continuous Drain Current (Note 5) V_{GS} = 10V	Steady State	T_A = 25°C T_A = 70°C	I_D	9.3 7.4	A
Continuous Drain Current (Note 5) V_{GS} = 10V	t ≤ 10s	T_A = 25°C T_A = 70°C	I_D	13.8 11.0	A
Continuous Drain Current (Note 5) V_{GS} = 4.5V	Steady State	T_A = 25°C T_A = 70°C	I_D	6.9 5.5	A
Continuous Drain Current (Note 5) V_{GS} = 4.5V	t ≤ 10s	T_A = 25°C T_A = 70°C	I_D	10.3 8.2	A
Pulsed Drain Current (Note 6)			I_{DM}	50	A

Thermal Characteristics

Characteristic	Symbol	Max	Unit
Power Dissipation (Note 4)	P_D	1.71	W
Thermal Resistance, Junction to Ambient @T_A = 25°C (Note 4)	$R_{\theta JA}$	72.9	°C/W
Power Dissipation (Note 5)	P_D	4.1	W
Thermal Resistance, Junction to Ambient @T_A = 25°C (Note 5)	$R_{\theta JA}$	30.8	°C/W
Power Dissipation (Note 5) t ≤ 10s	P_D	8.9	W
Thermal Resistance, Junction to Ambient @T_A = 25°C (Note 5) t ≤ 10s	$R_{\theta JA}$	14	°C/W
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +150	°C

Electrical Characteristics @ T_A = 25°C unless otherwise stated

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 7)						
Drain-Source Breakdown Voltage	BV_{DSS}	40	-	-	V	V_{GS} = 0V, I_D = 250μA
Zero Gate Voltage Drain Current T_J = 25°C	I_{DSS}	-	-	1.0	μA	V_{DS} = 40V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	-	-	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(th)}$	1.8	2.3	3.0	V	V_{DS} = V_{GS}, I_D = 250μA
Static Drain-Source On-Resistance	$R_{DS\ (ON)}$	-	20	30	mΩ	V_{GS} = 10V, I_D = 12A
		-	43	54		V_{GS} = 4.5V, I_D = 6A
Forward Transfer Admittance	$\|Y_{fs}\|$	-	11	-	S	V_{DS} = 5V, I_D = 12A
Diode Forward Voltage	V_{SD}	-	0.76	1.0	V	V_{GS} = 0V, I_S = 1A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	-	945	-	pF	V_{DS} = 20V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	-	69	-		
Reverse Transfer Capacitance	C_{rss}	-	58	-		
Gate Resistance	R_g	-	1.45	-	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge V_{GS} = 4.5V	Q_g	-	8.4	-	nC	V_{GS} = 4.5V, V_{DS} = 20V, I_D = 12A
Total Gate Charge V_{GS} = 10V	Q_g	-	18.6	-		V_{GS} = 10V, V_{DS} = 20V, I_D = 12A
Gate-Source Charge	Q_{gs}	-	3.3	-		
Gate-Drain Charge	Q_{gd}	-	2.2	-		
Turn-On Delay Time	$t_{D(on)}$	-	6.4	-	ns	V_{GS} = 10V, V_{DS} = 20V, R_L = 1.6Ω, R_G = 3Ω
Turn-On Rise Time	t_r	-	9.7	-	ns	
Turn-Off Delay Time	$t_{D(off)}$	-	19.8	-	ns	
Turn-Off Fall Time	t_f	-	3.1	-	ns	

Notes:
4. Device mounted on FR-4 PCB with minimum recommended pad layout, single sided.
5. Device mounted on 2" x 2" FR-4 PCB with high coverage 2 oz. Copper, single sided.
6. Repetitive rating, pulse width limited by junction temperature.
7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to production testing.

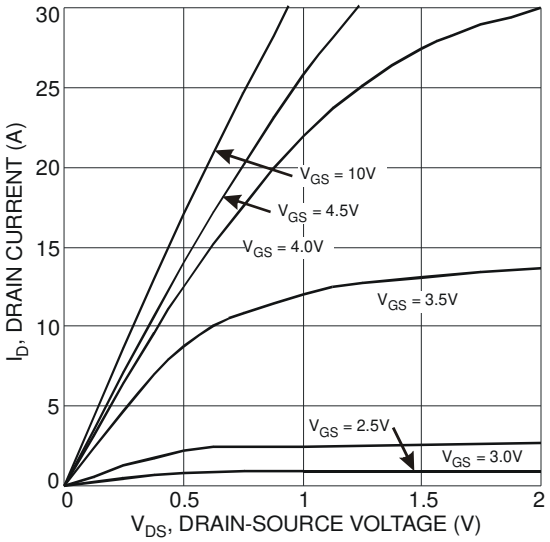


Fig. 1 Typical Output Characteristic

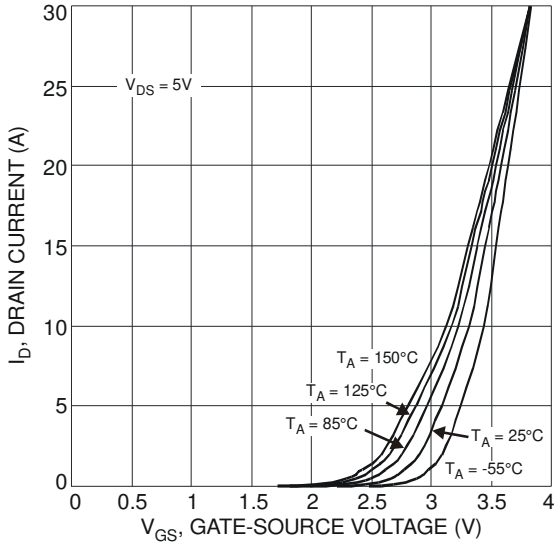


Fig. 2 Typical Transfer Characteristic

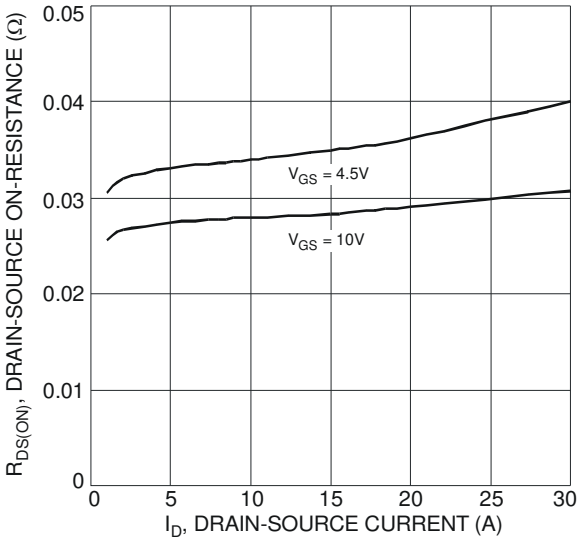


Fig. 3 Typical On-Resistance
vs. Drain Current and Gate Voltage

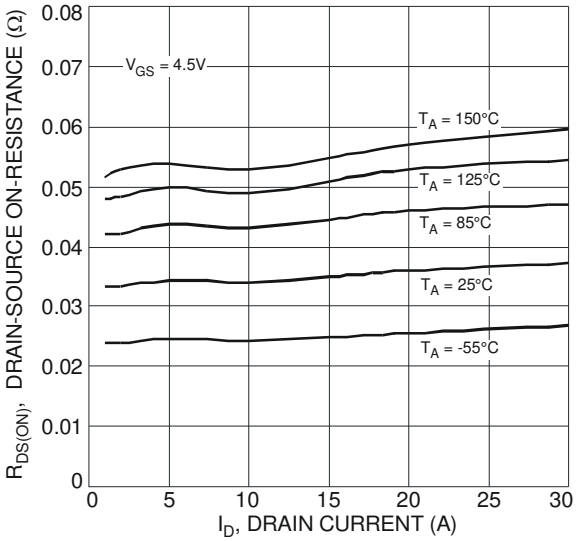


Fig. 4 Typical On-Resistance
vs. Drain Current and Temperature

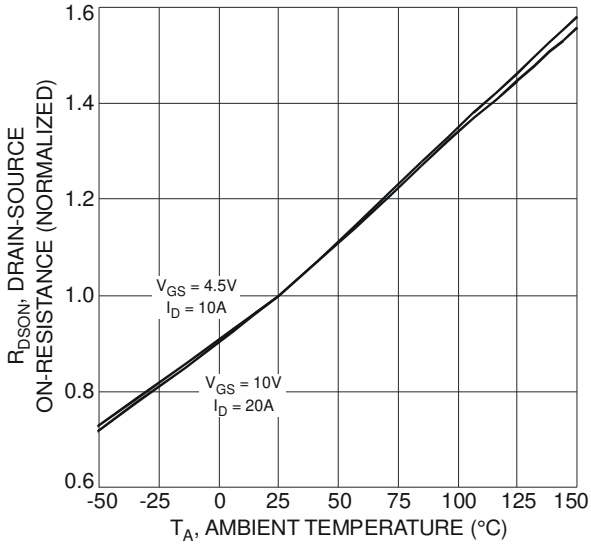


Fig. 5 On-Resistance Variation with Temperature

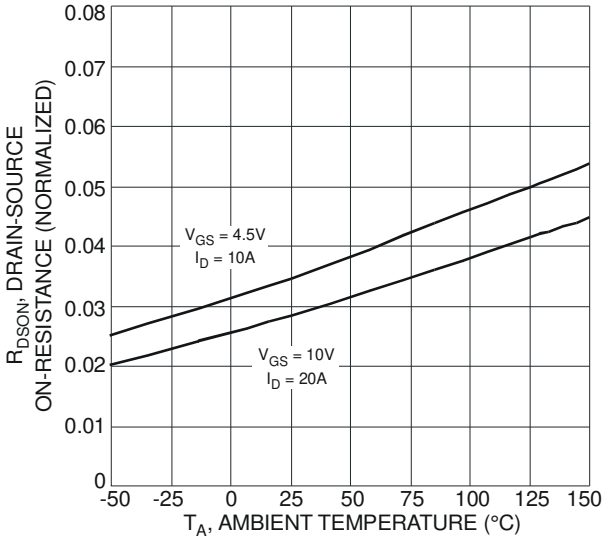


Fig. 6 On-Resistance Variation with Temperature

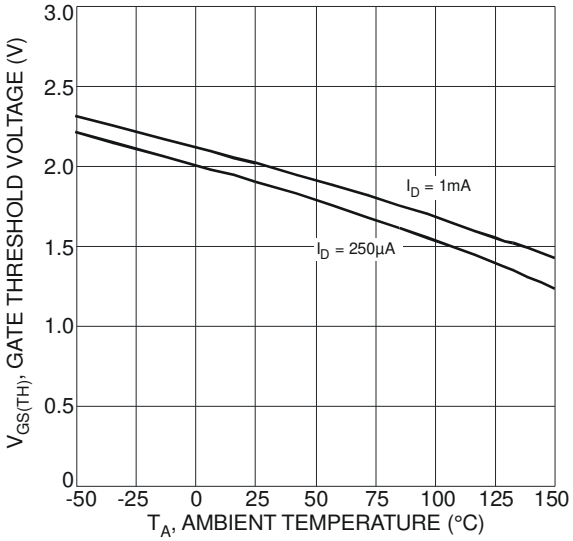


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

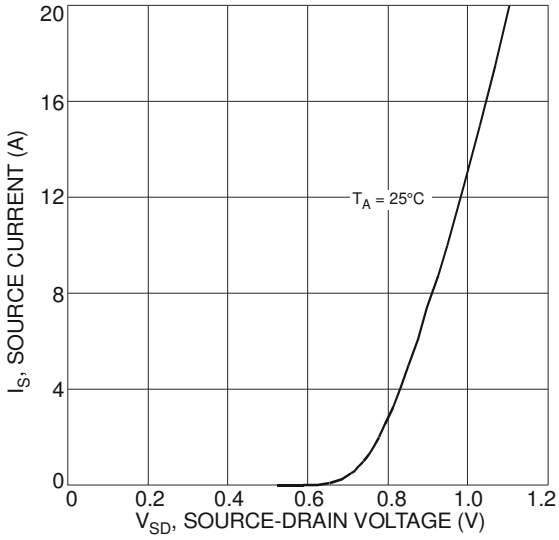


Fig. 8 Diode Forward Voltage vs. Current

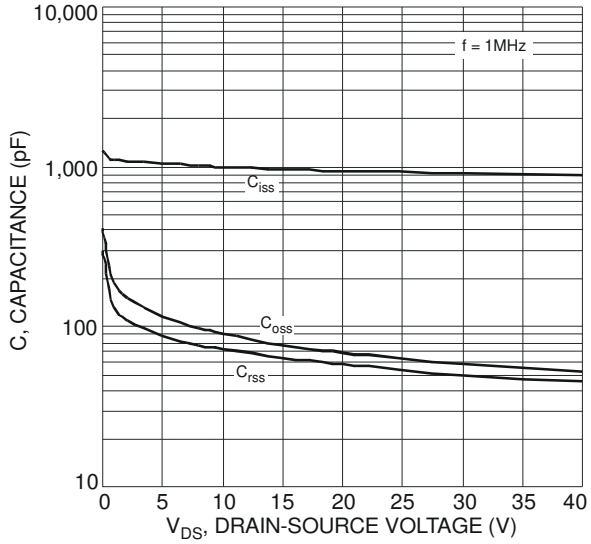


Fig. 9 Typical Total Capacitance

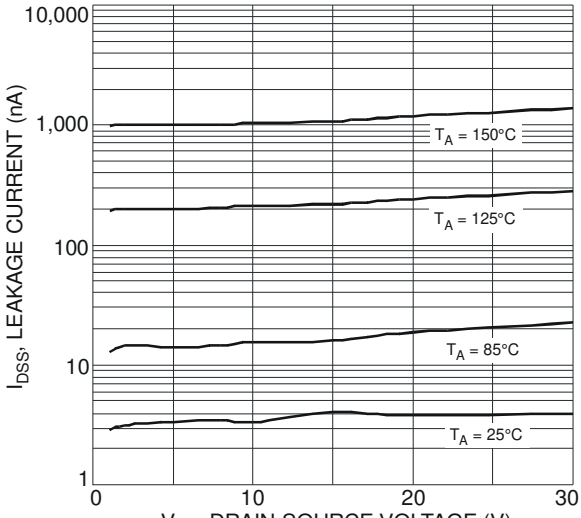


Fig. 10 Typical Leakage Current vs. Drain-Source Voltage

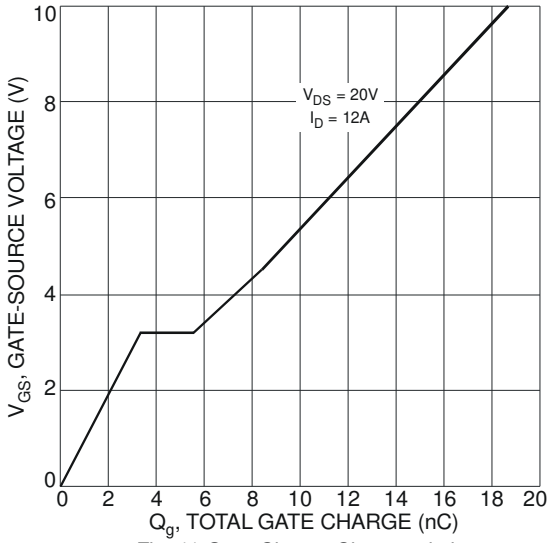


Fig. 11 Gate-Charge Characteristics

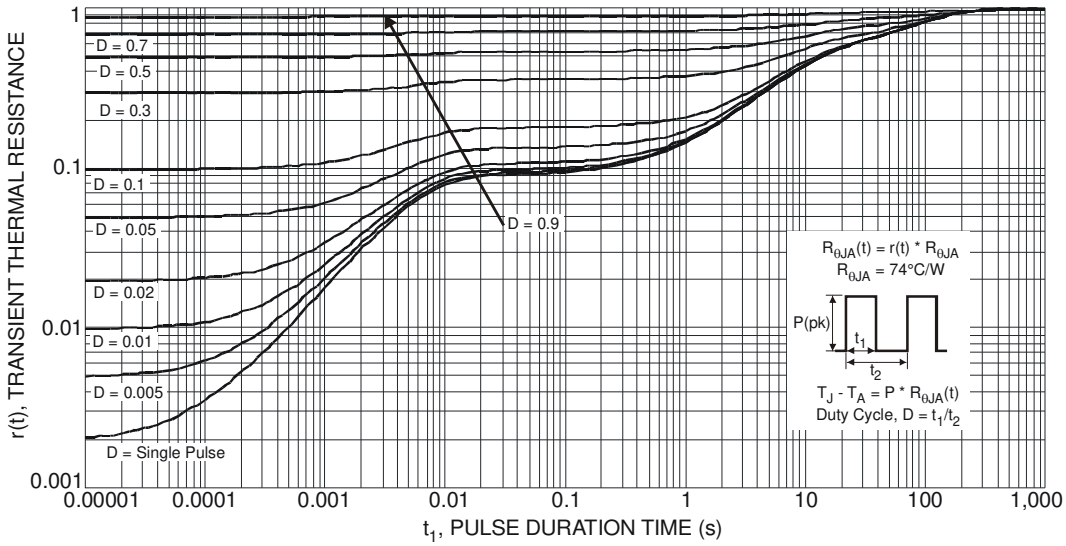
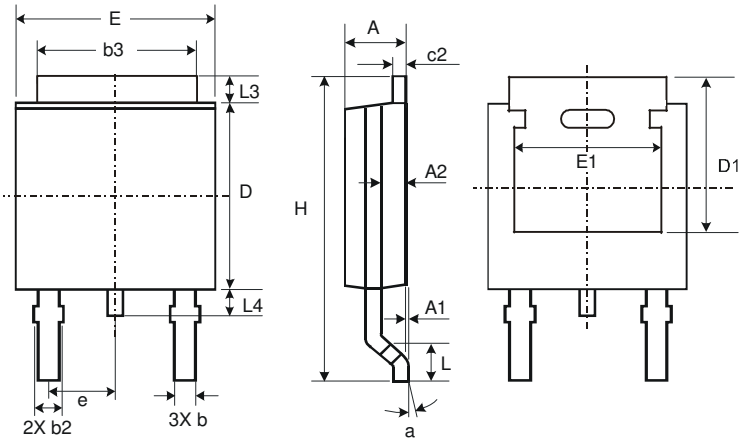


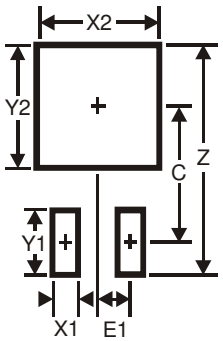
Fig. 12 Transient Thermal Response

Package Outline Dimensions



TO252-3L			
Dim	**Min**	**Max**	**Typ**
A	2.19	2.39	2.29
A1	0.00	0.13	0.08
A2	0.97	1.17	1.07
b	0.64	0.88	0.783
b2	0.76	1.14	0.95
b3	5.21	5.46	5.33
c2	0.45	0.58	0.531
D	6.00	6.20	6.10
D1	5.21	–	–
e	–	–	2.286
E	6.45	6.70	6.58
E1	4.32	–	–
H	9.40	10.41	9.91
L	1.40	1.78	1.59
L3	0.88	1.27	1.08
L4	0.64	1.02	0.83
a	0°	10°	–
All Dimensions in mm			

Suggested Pad Layout



Dimensions	Value (in mm)
Z	11.6
X1	1.5
X2	7.0
Y1	2.5
Y2	7.0
C	6.9
E1	2.3

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