

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)}$	I_D $T_A = 25^\circ C$
40V	8.5mΩ @ $V_{GS} = 10V$	27.6A
	14mΩ @ $V_{GS} = 4.5V$	21.5A

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.

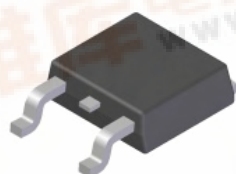
- Backlighting
- DC-DC Converters
- Power management functions

Features and Benefits

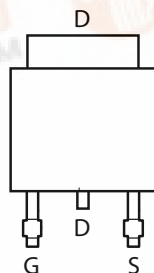
- Low on-resistance
- Fast switching speed
- "Green" component and RoHS compliant (Note 1)

Mechanical Data

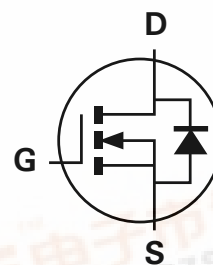
- Case: TO252-3L
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0 (Note 1)
- Moisture Sensitivity: Level 1 per J-STD-020D
- Terminals Connections: See Diagram
- Terminals: Matte Tin Finish annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208
- Marking Information: See Below
- Ordering Information: See Below
- Weight: 0.33 grams (approximate)



TOP VIEW



PIN OUT -TOP VIEW



Equivalent Circuit

Ordering Information (Note 1)

Product	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
DMN4009LK3-13	N4009L	13	16	2,500

Note: 1. Diodes, Inc. defines "Green" products as those which are Eu RoHS compliant and contain no halogens or antimony compounds; further information about Diodes Inc.'s "Green" Policy can be found on our website. For packaging details, go to our website.

Marking Information



DII = Manufacturer's Marking
N4009L = Product Type Marking Code
YYWW = Date Code Marking
YY = Last two digits of year (ex: 09 = 2009)
WW = Week (01-52)

Maximum Ratings @T_A = 25°C unless otherwise specified

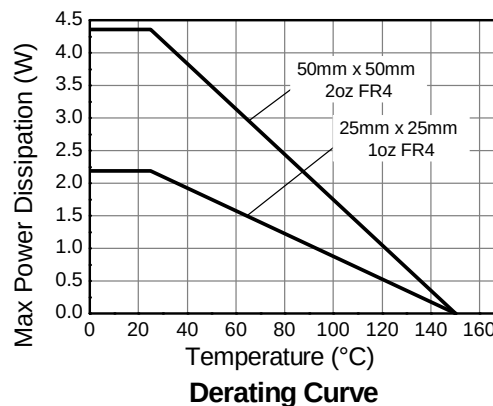
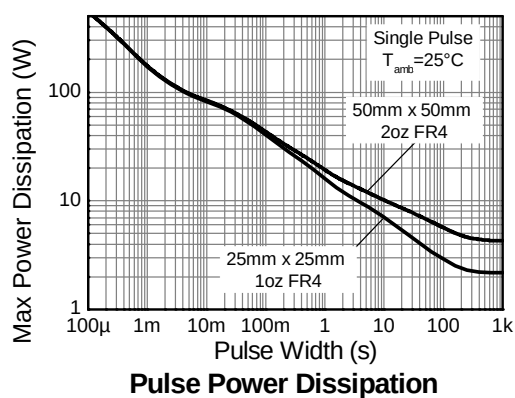
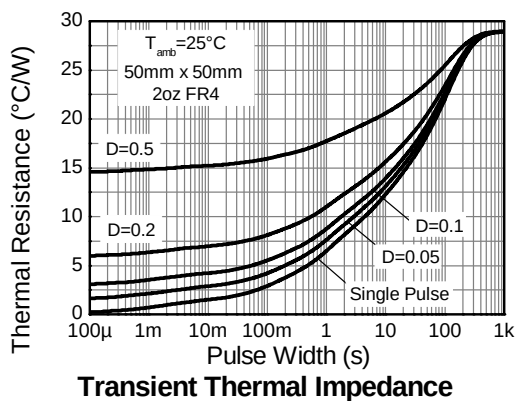
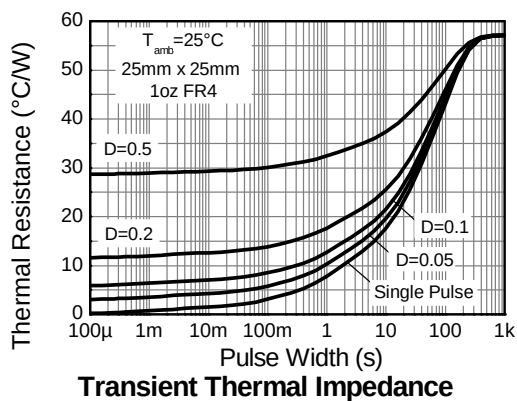
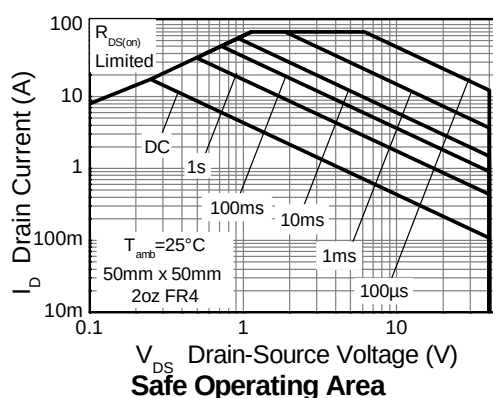
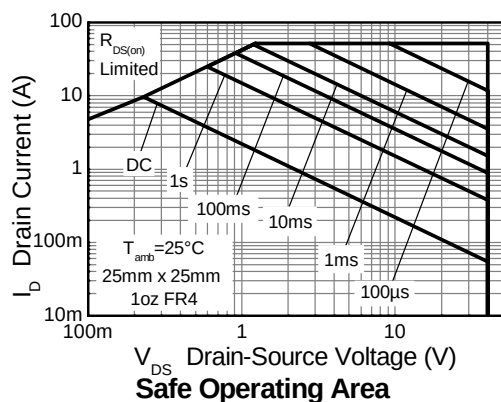
Characteristic			Symbol	Value	Unit
Drain-Source voltage			V _{DSS}	40	V
Gate-Source voltage			V _{GS}	±20	V
Continuous Drain current	V _{GS} = 10V	(Note 3)	I _D	27.6	A
		T _A =70°C (Note 3)		22.1	
		(Note 2)		18.0	
Pulsed Drain current	V _{GS} = 10V	(Note 4)	I _{DM}	96.6	A
Continuous Source current (Body diode)		(Note 3)	I _S	13.2	A
Pulsed Source current (Body diode)		(Note 4)	I _{SM}	96.6	A

Thermal Characteristics @T_A = 25°C unless otherwise specified

Characteristic		Symbol	Value	Unit
Power dissipation Linear derating factor	(Note 2)	P _D	4.36	W mW/°C
			34.8	
	(Note 3)		10.3	
			82.4	
Thermal Resistance, Junction to Ambient	(Note 5)	R _{θJA}	2.19	°C/W
			17.5	
	(Note 2)		28.6	
Thermal Resistance, Junction to Lead	(Note 3)	R _{θJL}	12.1	°C/W
	(Note 5)		57.0	
Operating and storage temperature range		T _J , T _{STG}	-55 to 150	°C

- Notes:
2. For a device surface mounted on 50mm x 50mm x 1.6mm FR4 PCB with high coverage of single sided 2oz copper, in still air conditions; the device is measured when operating in a steady-state condition.
 3. Same as note 2, except the device is measured at t ≤ 10 sec.
 4. Same as note 2, except the device is pulsed with D = 0.02 and pulse width 300 μs. The pulse current is limited by the maximum junction temperature.
 5. For a device surface mounted on 25mm x 25mm x 1.6mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions; the device is measured when operating in a steady-state condition.
 6. Thermal resistance from junction to solder-point (at the end of the drain lead).

Thermal Characteristics

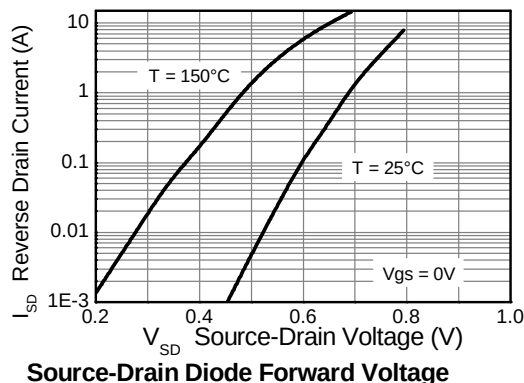
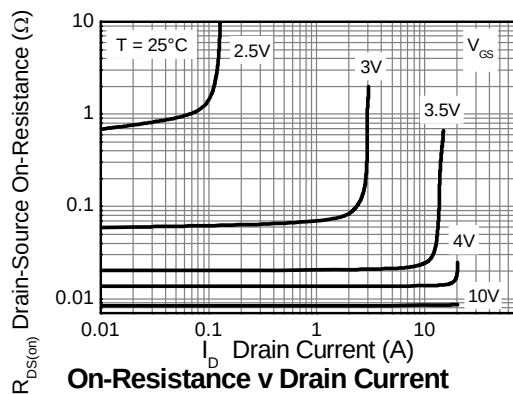
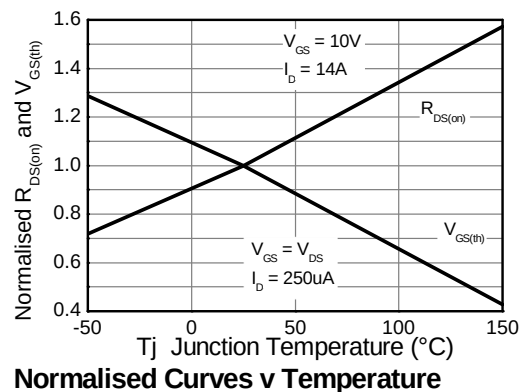
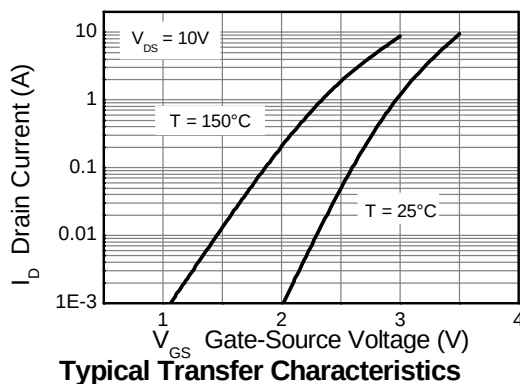
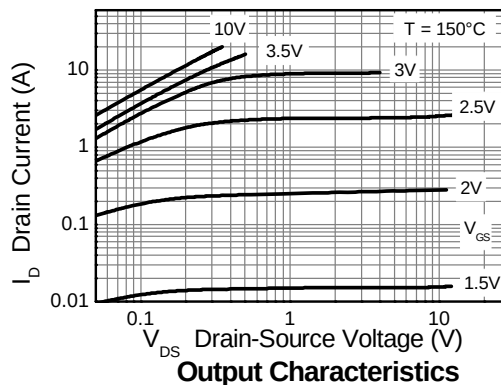
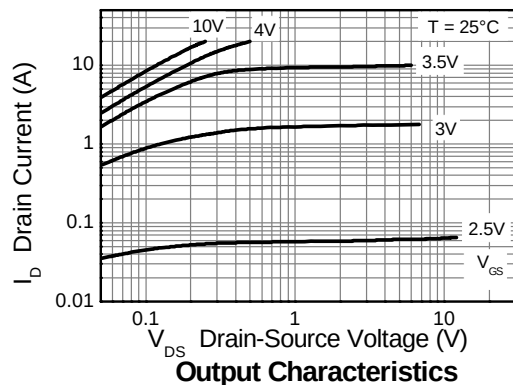


Electrical Characteristics @T_A = 25°C unless otherwise specified

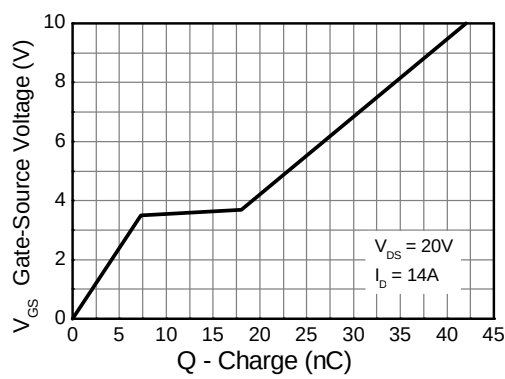
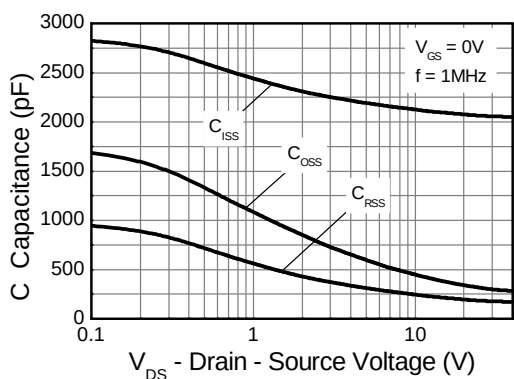
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition	
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage	BV _{DSS}	40	—	—	V	I _D = 250μA, V _{GS} = 0V	
Zero Gate Voltage Drain Current	I _{DSS}	—	—	0.5	μA	V _{DS} = 40V, V _{GS} = 0V	
Gate-Source Leakage	I _{GSS}	—	—	±100	nA	V _{GS} = ±20V, V _{DS} = 0V	
ON CHARACTERISTICS							
Gate Threshold Voltage	V _{GS(th)}	1.0	—	3.0	V	I _D = 250μA, V _{DS} = V _{GS}	
Static Drain-Source On-Resistance (Note 7)	R _{DS (ON)}	—	—	8.5	mΩ	V _{GS} = 10V, I _D = 14A	
				14		V _{GS} = 4.5V, I _D = 11A	
Forward Transconductance (Notes 7 & 8)	g _{fs}	—	35.3	—	S	V _{DS} = 15V, I _D = 12A	
Diode Forward Voltage (Note 7)	V _{SD}	—	0.82	1.0	V	I _S = 14A, V _{GS} = 0V	
Reverse recovery time (Note 8)	t _{rr}		141	—	ns	I _S = 14A, di/dt= 100A/μs	
Reverse recovery charge (Note 8)	Q _{rr}	—	872	—	nC		
DYNAMIC CHARACTERISTICS (Note 8)							
Input Capacitance	C _{iss}	—	2072	—	pF	V _{DS} = 20V, V _{GS} = 0V f= 1MHz	
Output Capacitance	C _{oss}	—	338	—	pF		
Reverse Transfer Capacitance	C _{rss}	—	193	—	pF		
Total Gate Charge	Q _g	—	21	—	nC	V _{GS} = 4.5V	V _{DS} = 20V I _D = 14A
Total Gate Charge	Q _g	—	42	—	nC	V _{GS} = 10V	
Gate-Source Charge	Q _{gs}	—	7.3	—	nC		
Gate-Drain Charge	Q _{gd}	—	10.7	—	nC		
Turn-On Delay Time (Note 9)	t _{D(on)}	—	7.8	—	ns	V _{DD} = 20V, V _{GS} = 10V I _D = 14A, R _G ≅ 6.0Ω	
Turn-On Rise Time (Note 9)	t _r	—	18.5	—	ns		
Turn-Off Delay Time (Note 9)	t _{D(off)}	—	37.3	—	ns		
Turn-Off Fall Time (Note 9)	t _f	—	14.9	—	ns		

- Notes:
7. Measured under pulsed conditions. Pulse width ≤ 300μs; duty cycle ≤ 2%
 8. For design aid only, not subject to production testing.
 9. Switching characteristics are independent of operating junction temperatures.

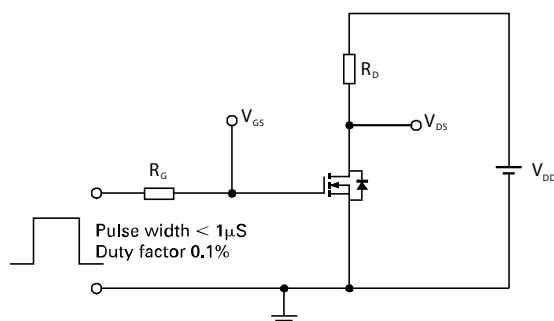
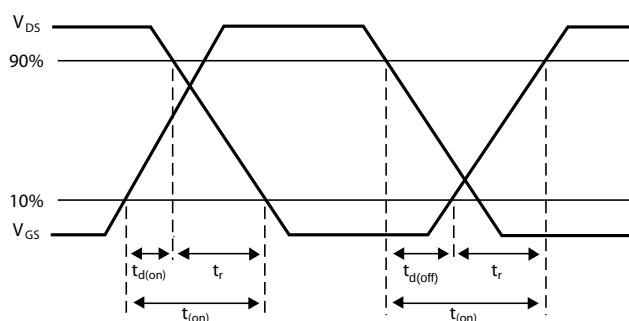
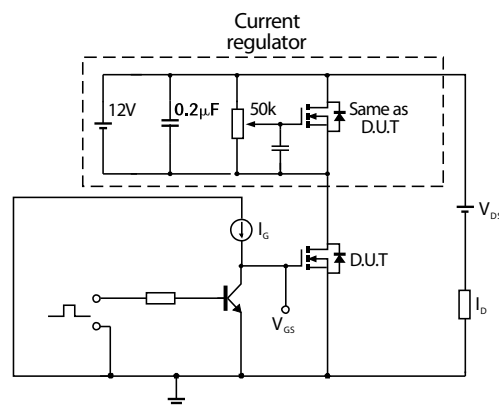
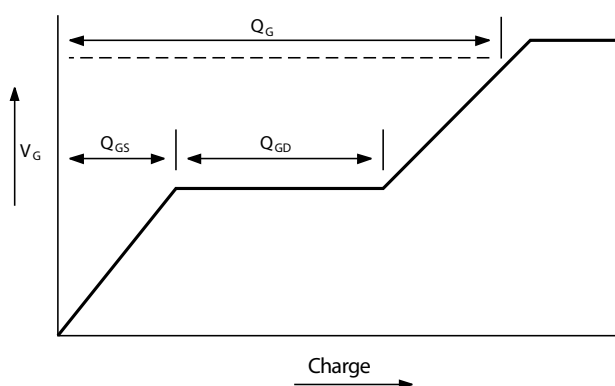
Typical Characteristics



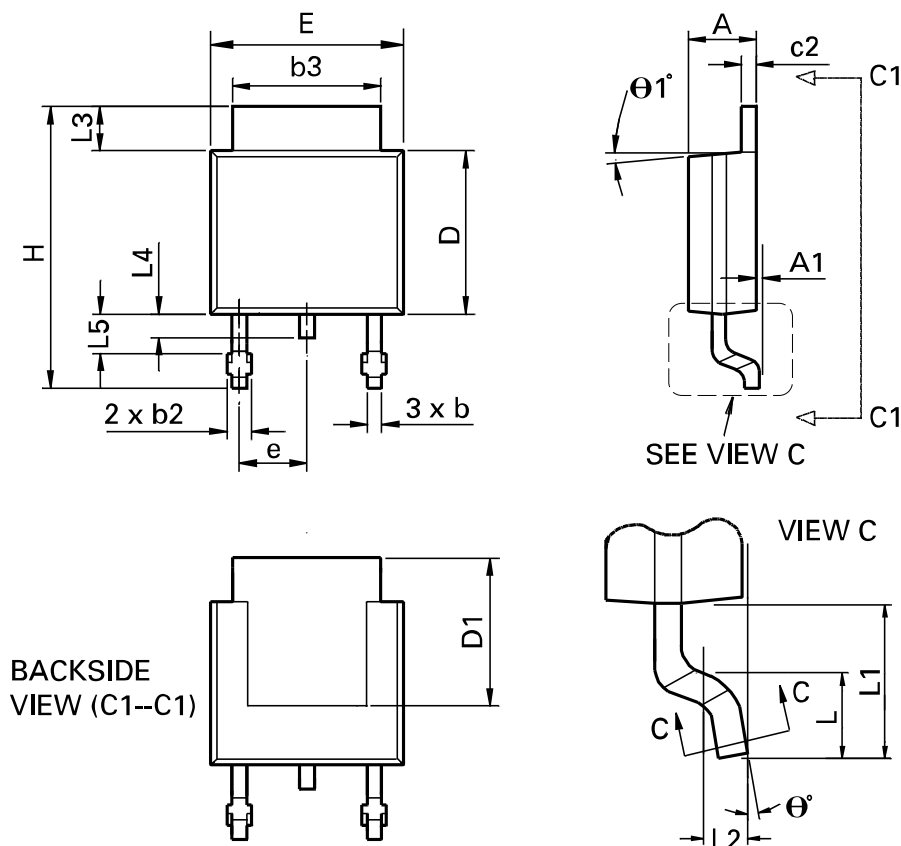
Typical Characteristics - continued



Test Circuits

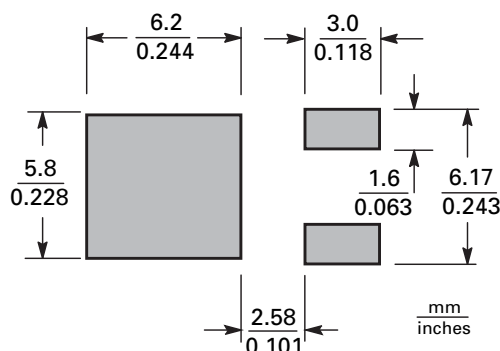


Package Outline Dimensions



DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min	Max	Min	Max		Min	Max	Min	Max
A	0.086	0.094	2.18	2.39	e	0.090 BSC		2.29 BSC	
A1	-	0.005	-	0.127	H	0.370	0.410	9.40	10.41
b	0.020	0.035	0.508	0.89	L	0.055	0.070	1.40	1.78
b2	0.030	0.045	0.762	1.14	L1	0.108 REF		2.74 REF	
b3	0.205	0.215	5.21	5.46	L2	0.020 BSC		0.508 BSC	
c	0.018	0.024	0.457	0.61	L3	0.035	0.065	0.89	1.65
c2	0.018	0.023	0.457	0.584	L4	0.025	0.040	0.635	1.016
D	0.213	0.245	5.41	6.22	L5	0.045	0.060	1.14	1.52
D1	0.205	-	5.21	-	θ1°	0°	10°	0°	10°
E	0.250	0.265	6.35	6.73	θ°	0°	15°	0°	15°
E1	0.170	-	4.32	-	-	-	-	-	-

Suggested Pad Layout



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