





DMN6068SE

#### **60V N-CHANNEL ENHANCEMENT MODE MOSFET**

## **Product Summary**

V <sub>(BR)DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub> T <sub>A</sub> = +25°C
60V	68mΩ @ V <sub>GS</sub> = 10V	5.6A
000	100mΩ @ V <sub>GS</sub> = 4.5V	4.7A

### **Description**

This MOSFET has been designed to minimize the on-state resistance and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

### **Applications**

- Motor Control
- Transformer Driving Switch
- DC-DC Converters
- Power Management Functions
- Uninterrupted Power Supply

#### **Features and Benefits**

- 100% Unclamped Inductive Switch (UIS) test in production
- Low on-resistance
- Fast switching speed
- Lead-Free Finish; RoHS compliant (Notes 1 & 2)
- Halogen and Antimony Free. "Green" Device (Note 3)
- Qualified to AEC-Q101 Standards for High Reliability

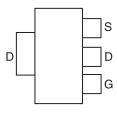
#### **Mechanical Data**

- Case: SOT223
- 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 below
- Terminals: Finish Matte Tin annealed over Copper lead frame.
   Solderable per MIL-STD-202, Method 208 (23)
- Weight: 0.112 grams (approximate)

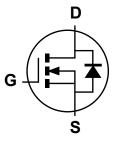
SOT223



Top View



Pin Out - Top View



Equivalent Circuit

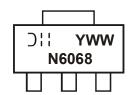
#### Ordering Information (Note 4 & 5)

Part Number	Qualification	Case	Packaging
DMN6068SE-13	Standard	SOT223	4000 / Tape & Reel
DMN6068SEQ-13	Automotive	SOT223	4000 / Tape & Reel

Notes:

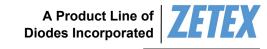
- 1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. All applicable RoHS exemptions applied.
- 2. See http://www.diodes.com/quality/lead\_free.html for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
- 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
- 4. For packaging details, go to our website at http://www.diodes.com/products/packages.html.
- 5. Automotive products are AEC-Q101 qualified and are PPAP capable. Automotive, AEC-Q101 and standard products are electrically and thermally the same, except where specified. For more information, please refer to http://www.diodes.com/quality/product\_grade\_definitions/.

## **Marking Information**



Oll = Manufacturer's Marking
N6068 = Product Type Marking Code
YWW = Date Code Marking
Y = Year (ex: 9 = 2009)
WW = Week (01 - 53)





DMN6068SE

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

Characteristic		Symbol	Value	Unit	
Drain-Source voltage		$V_{DSS}$	60	V	
Gate-Source voltage		(Note 6)	V <sub>GS</sub>	±20	V
Single Pulsed Avalanche Er	nergy	(Note 11)	E <sub>AS</sub>	37.5	mJ
Single Pulsed Avalanche Cu	urrent	(Note 11)	I <sub>AS</sub>	5.0	Α
		(Note 8)		5.6	
Continuous Drain current	V <sub>GS</sub> = 10V	T <sub>A</sub> = +70°C (Note 8)	I <sub>D</sub>	4.5	Α
		(Note 7)		4.1	
Pulsed Drain current	V <sub>GS</sub> = 10V	(Note 9)	I <sub>DM</sub>	20.8	Α
Continuous Source current (	(Body diode)	(Note 8)	I <sub>S</sub>	4.9	Α
Pulsed Source current (Bod	y diode)	(Note 9)	I <sub>SM</sub>	20.8	Α

#### Thermal Characteristics (@TA = +25°C, unless otherwise specified.)

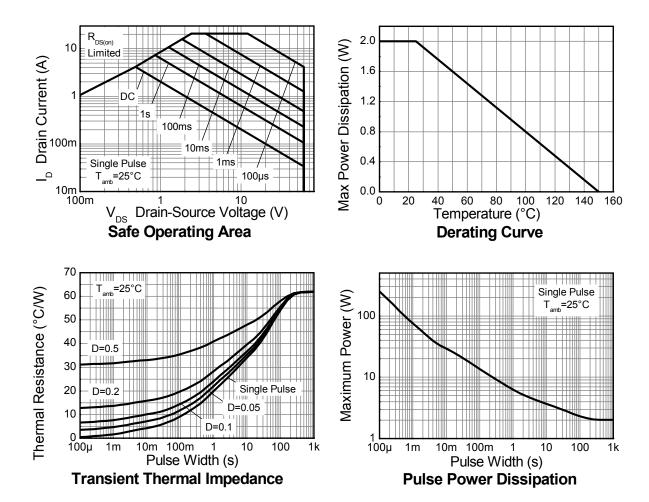
Characteristic		Symbol	Value	Unit	
Power dissipation	(Note 7)		2.0 16.0	W	
Linear derating factor	(Note 8)	P <sub>D</sub>	3.7 29.5	mW/°C	
Thermal Desistance Junction to Ambient	(Note 7)	Б	62.5		
Thermal Resistance, Junction to Ambient	(Note 8)	$R_{\theta JA}$	34	°C/W	
Thermal Resistance, Junction to Lead	(Note 10)	R <sub>θJL</sub>	11.5		
Operating and storage temperature range		T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C	

#### Notes:

- 6. AEC-Q101 V<sub>GS</sub> maximum is ±16V.
  7. For a device surface mounted on 25mm x 25mm 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.
- 8. Same as note (3), except the device is measured at  $t \le 10$  sec.
- 9. Same as note (3), except the device is pulsed with D= 0.02 and pulse width 300µs. The pulse current is limited by the maximum junction temperature.
- 10. Thermal resistance from junction to solder-point (at the end of the drain lead). 
  11. UIS in production with L = 3.0mH,  $I_{AS}$  = 5.0A,  $R_{G}$  = 25 $\Omega$ ,  $V_{DD}$ =50V, starting  $T_{J}$  = +25°C.



## **Thermal Characteristics**







DMN6068SE

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

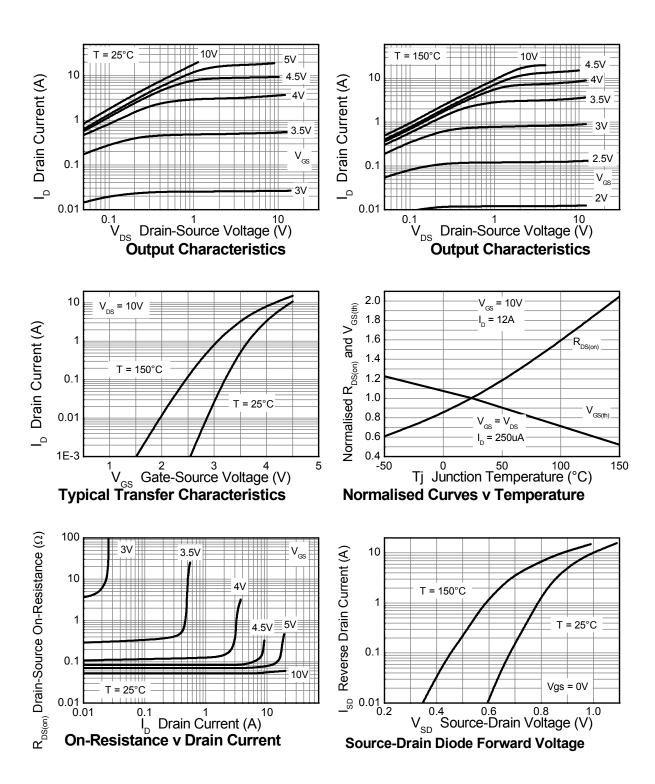
Characteristic	Symbol	Min	Тур	Max	Unit	Test C	ondition
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	60	_	_	V	I <sub>D</sub> = 250μA, V <sub>GS</sub> = 0V	
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	_	_	0.5	μΑ	V <sub>DS</sub> = 60V, V <sub>GS</sub> =	= 0V
Gate-Source Leakage	I <sub>GSS</sub>	_	_	±100	nA	$V_{GS} = \pm 20V, V_{DS}$	= 0V
ON CHARACTERISTICS	•					•	
Gate Threshold Voltage	V <sub>GS(th)</sub>	1.0	_	3.0	V	I <sub>D</sub> = 250μA, V <sub>DS</sub> =	= V <sub>GS</sub>
Static Dunin Course On Desigtance (Nate 42)	_			0.068	0	V <sub>GS</sub> = 10V, I <sub>D</sub> = 12A	
Static Drain-Source On-Resistance (Note 12)	R <sub>DS (ON)</sub>	_	_	0.100	Ω	V <sub>GS</sub> = 4.5V, I <sub>D</sub> =	6A
Forward Transconductance (Notes 12 & 13)	9 <sub>fs</sub>		19.7	_	S	V <sub>DS</sub> = 15V, I <sub>D</sub> = 1	2A
Diode Forward Voltage (Note 12)	$V_{SD}$	_	0.98	1.15	V	I <sub>S</sub> = 12A, V <sub>GS</sub> = 0V	
Reverse recovery time (Note 13)	t <sub>rr</sub>		145	_	ns	I <sub>S</sub> = 12A, di/dt= 100A/µs	
Reverse recovery charge (Note 13)	Q <sub>rr</sub>	_	929	_	nC		
DYNAMIC CHARACTERISTICS (Note 13)				•	•		
Input Capacitance	C <sub>iss</sub>	_	502	_	pF	V <sub>DS</sub> = 30V, V <sub>GS</sub> = 0V f= 1MHz	
Output Capacitance	Coss	_	45.7	_	pF		
Reverse Transfer Capacitance	Crss	_	27.1	_	pF		
Total Gate Charge (Note 14)	Qg	_	5.55	_	nC	V <sub>GS</sub> = 4.5V	
Total Gate Charge (Note 14)	Qg	_	10.3	_	nC	V <sub>DS</sub> = 30V I <sub>D</sub> = 12A	
Gate-Source Charge (Note 14)	Qgs	_	1.6	_	nC		
Gate-Drain Charge(Note 14)	Q <sub>gd</sub>		3.5	_	nC		
Turn-On Delay Time (Note 14)	t <sub>D(on)</sub>	_	3.6	_	ns	$V_{DD}$ = 30V, $V_{GS}$ = 10V $I_D$ = 12A, $R_G \approx 6.0\Omega$	
Turn-On Rise Time (Note 14)	t <sub>r</sub>	_	10.8	_	ns		
Turn-Off Delay Time (Note 14)	t <sub>D(off)</sub>	_	11.9	_	ns		
Turn-Off Fall Time (Note 14)	t <sub>f</sub>	_	8.7	_	ns		

Notes:

- 12. Measured under pulsed conditions. Pulse width  $\leq$  300µs; duty cycle  $\leq$  2% 13. For design aid only, not subject to production testing. 14. Switching characteristics are independent of operating junction temperatures.

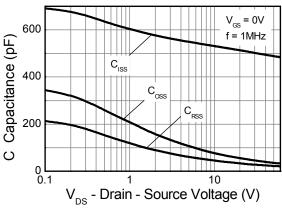


## **Typical Characteristics**





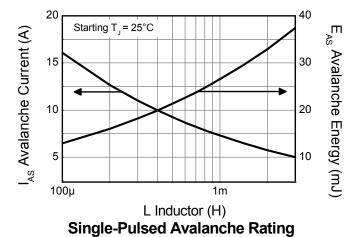
## **Typical Characteristics** (cont.)



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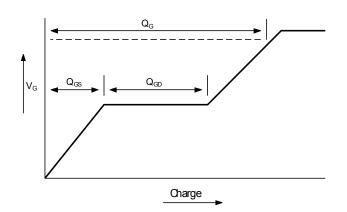
Capacitance v Drain-Source Voltage

Gate-Source Voltage v Gate Charge





## **Test Circuits**



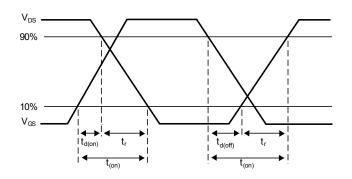
Ourrent regulator

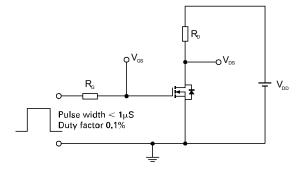
12V 0.2µF 50k Same as D.U.T

Vos

Basic gate charge waveform

Gate charge test circuit





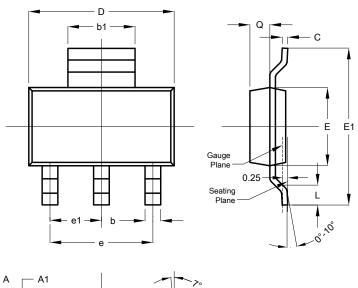
Switching time waveforms

Switching time test circuit

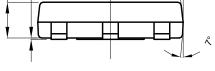


## **Package Outline Dimensions**

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

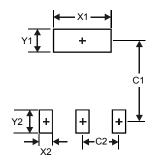


SOT223					
Dim	Min	Max	Тур		
Α	1.55	1.65	1.60		
A1	0.010	0.15	0.05		
b	0.60	0.80	0.70		
b1	2.90	3.10	3.00		
С	0.20	0.30	0.25		
D	6.45	6.55	6.50		
Е	3.45	3.55	3.50		
E1	6.90	7.10	7.00		
е	-	-	4.60		
e1	-	-	2.30		
L	0.85	1.05	0.95		
Q	0.84	0.94	0.89		
All Dimensions in mm					



## **Suggested Pad Layout**

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



Dimensions	Value (in mm)
X1	3.3
X2	1.2
Y1	1.6
Y2	1.6
C1	6.4
C2	2.3





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