

## 60V N-CHANNEL ENHANCEMENT MODE MOSFET

### Product Summary

$V_{(BR)DSS}$	$R_{DS(on)}$	$I_D$ $T_A = 25^\circ C$
60V	68m $\Omega$ @ $V_{GS} = 10V$	5.6A
	100m $\Omega$ @ $V_{GS} = 4.5V$	4.7A

### Description and Applications

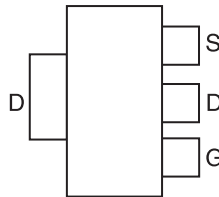
This MOSFET has been designed to minimize the on-state resistance and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

- Motor control
- Transformer driving switch
- DC-DC Converters
- Power management functions
- Uninterrupted power supply

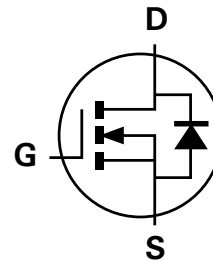
SOT223



Top View



Pin Out - Top View



Equivalent Circuit

### Features and Benefits

- 100% Unclamped Inductive Switch (UIS) test in production
- Low on-resistance
- Fast switching speed
- "Green" component and RoHS compliant (Note 1)
- Qualified to AEC-Q101 Standards for High Reliability

### Mechanical Data

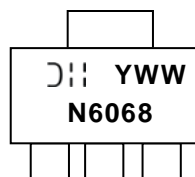
- Case: SOT223
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0 (Note 1)
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals Connections: See diagram below
- Terminals: Finish - Matte Tin annealed over Copper lead frame. Solderable per MIL-STD-202, Method 208
- Weight: 0.112 grams (approximate)

### Ordering Information (Note 1)

Product	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
DMN6068SE-13	N6068	13	12	2,500

Notes: 1. Diodes, Inc. defines "Green" products as those which are 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  
N6068 = Product Type Marking Code  
YWW = Date Code Marking  
Y = Year (ex: 9 = 2009)  
WW = Week (01-52)

**Maximum Ratings** @T<sub>A</sub> = 25°C unless otherwise specified

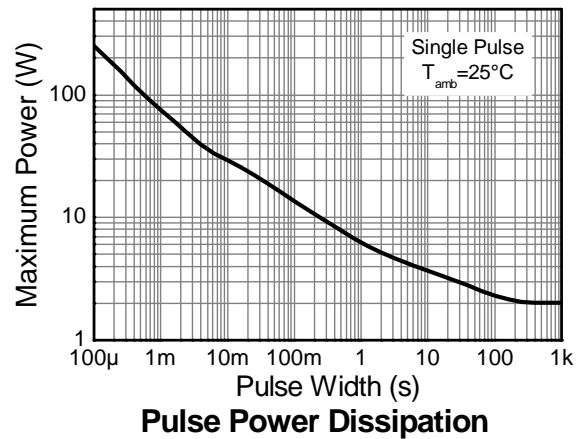
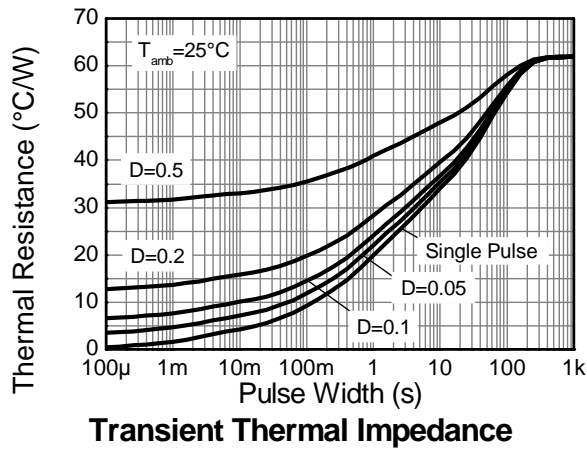
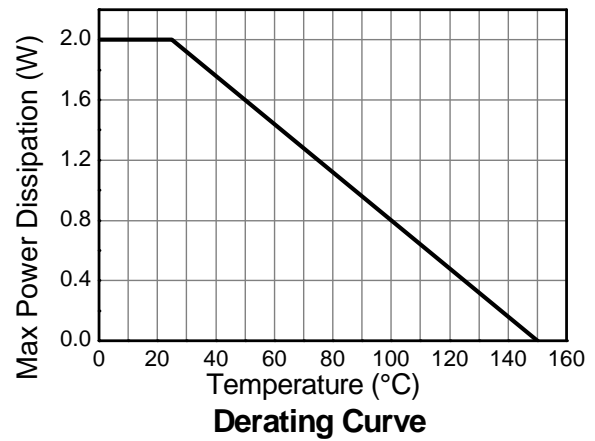
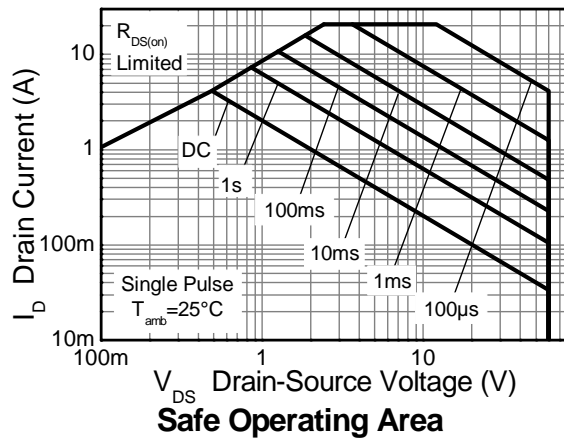
Characteristic		Symbol	Value	Unit
Drain-Source voltage		V <sub>DSS</sub>	60	V
Gate-Source voltage	(Note 2)	V <sub>GS</sub>	±20	V
Single Pulsed Avalanche Energy	(Note 7)	E <sub>AS</sub>	37.5	mJ
Single Pulsed Avalanche Current	(Note 7)	I <sub>AS</sub>	5.0	A
Continuous Drain current	V <sub>GS</sub> = 10V	(Note 4)	5.6	A
		T <sub>A</sub> = 70°C (Note 4)	4.5	
		(Note 3)	4.1	
Pulsed Drain current	V <sub>GS</sub> = 10V	I <sub>DM</sub>	20.8	A
Continuous Source current (Body diode)		I <sub>S</sub>	4.9	A
Pulsed Source current (Body diode)		I <sub>SM</sub>	20.8	A

**Thermal Characteristics** @T<sub>A</sub> = 25°C unless otherwise specified

Characteristic		Symbol	Value	Unit
Power dissipation	(Note 3)	P <sub>D</sub>	2.0	W
			16.0	
Linear derating factor	(Note 4)		3.7	mW/°C
			29.5	
Thermal Resistance, Junction to Ambient	(Note 3)	R <sub>θJA</sub>	62.5	°C/W
	(Note 4)		34	
Thermal Resistance, Junction to Lead	(Note 6)	R <sub>θJL</sub>	11.5	
Operating and storage temperature range		T <sub>J</sub> , T <sub>STG</sub>	-55 to 150	°C

- Notes:
- AEC-Q101 V<sub>GS</sub> maximum is ±16V.
  - 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.
  - Same as note (3), except the device is measured at t ≤ 10 sec.
  - Same as note (3), except the device is pulsed with D= 0.02 and pulse width 300 μs. The pulse current is limited by the maximum junction temperature.
  - Thermal resistance from junction to solder-point (at the end of the drain lead).
  - UIS in production with L = 3.0mH, I<sub>AS</sub> = 5.0A, R<sub>G</sub> = 25Ω, V<sub>DD</sub>=50V, starting T<sub>J</sub> = 25°C.

## Thermal Characteristics

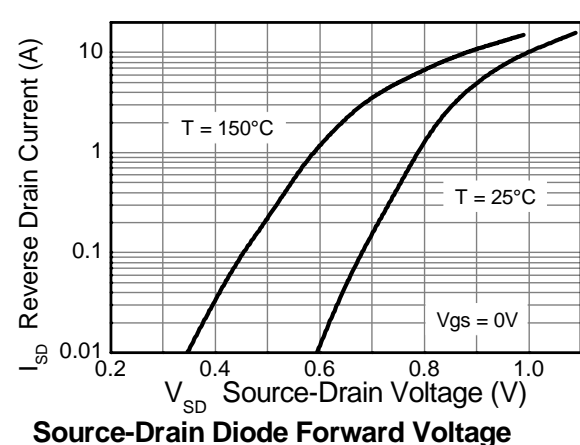
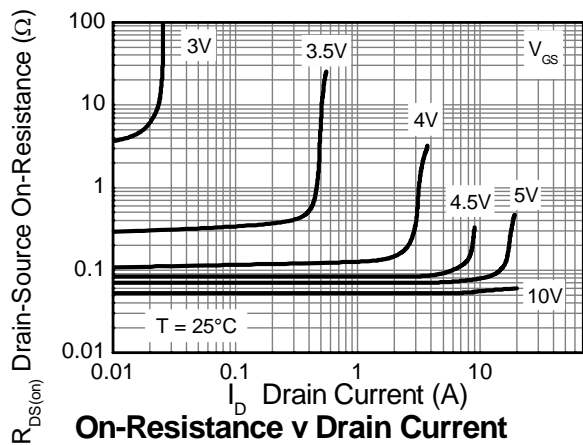
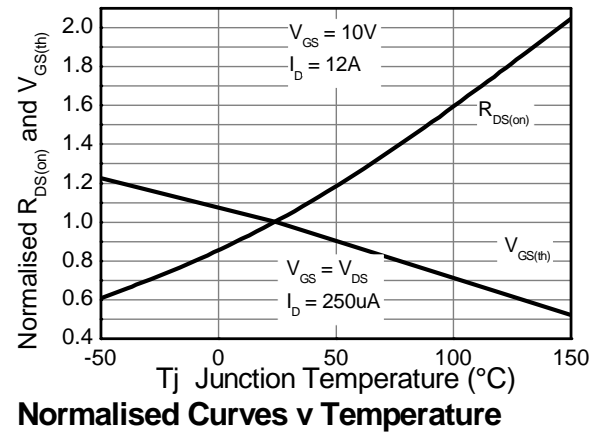
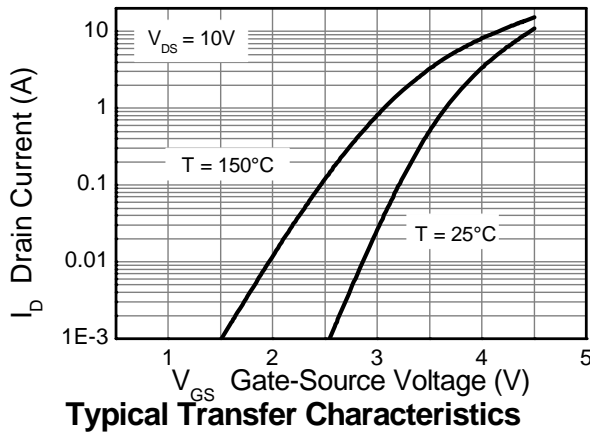
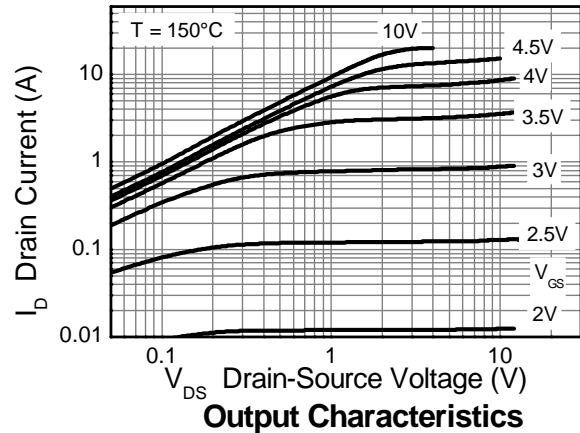
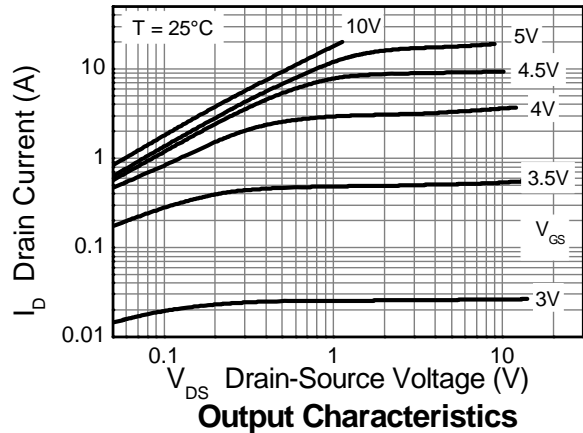


**Electrical Characteristics** @  $T_A = 25^\circ\text{C}$  unless otherwise specified

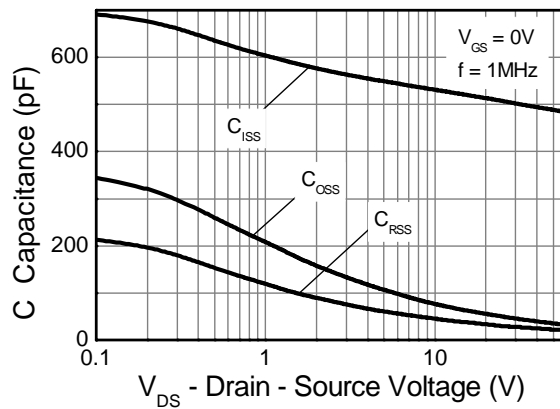
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition	
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage	$BV_{DSS}$	60	—	—	V	$I_D = 250\mu A$ , $V_{GS} = 0V$	
Zero Gate Voltage Drain Current	$I_{DSS}$	—	—	0.5	$\mu A$	$V_{DS} = 60V$ , $V_{GS} = 0V$	
Gate-Source Leakage	$I_{GSS}$	—	—	$\pm 100$	nA	$V_{GS} = \pm 20V$ , $V_{DS} = 0V$	
ON CHARACTERISTICS							
Gate Threshold Voltage	$V_{GS(th)}$	1.0	—	3.0	V	$I_D = 250\mu A$ , $V_{DS} = V_{GS}$	
Static Drain-Source On-Resistance (Note 8)	$R_{DS(ON)}$	—	—	0.068	$\Omega$	$V_{GS} = 10V$ , $I_D = 12A$	
				0.100		$V_{GS} = 4.5V$ , $I_D = 6A$	
Forward Transconductance (Notes 8 & 9)	$g_{fs}$	—	19.7	—	S	$V_{DS} = 15V$ , $I_D = 12A$	
Diode Forward Voltage (Note 8)	$V_{SD}$	—	0.98	1.15	V	$I_S = 12A$ , $V_{GS} = 0V$	
Reverse recovery time (Note 9)	$t_{rr}$		145	—	ns	$I_S = 12A$ , $di/dt = 100A/\mu s$	
Reverse recovery charge (Note 9)	$Q_{rr}$	—	929	—	nC		
DYNAMIC CHARACTERISTICS (Note 9)							
Input Capacitance	$C_{iss}$	—	502	—	pF	$V_{DS} = 30V$ , $V_{GS} = 0V$ $f = 1MHz$	
Output Capacitance	$C_{oss}$	—	45.7	—	pF		
Reverse Transfer Capacitance	$C_{rss}$	—	27.1	—	pF		
Total Gate Charge (Note 10)	$Q_g$	—	5.55	—	nC	$V_{GS} = 4.5V$	$V_{DS} = 30V$ $I_D = 12A$
Total Gate Charge (Note 10)	$Q_g$	—	10.3	—	nC	$V_{GS} = 10V$	
Gate-Source Charge (Note 10)	$Q_{gs}$	—	1.6	—	nC		
Gate-Drain Charge(Note 10)	$Q_{gd}$	—	3.5	—	nC		
Turn-On Delay Time (Note 10)	$t_{D(on)}$	—	3.6	—	ns	$V_{DD} = 30V$ , $V_{GS} = 10V$ $I_D = 12A$ , $R_G \cong 6.0\Omega$	
Turn-On Rise Time (Note 10)	$t_r$	—	10.8	—	ns		
Turn-Off Delay Time (Note 10)	$t_{D(off)}$	—	11.9	—	ns		
Turn-Off Fall Time (Note 10)	$t_f$	—	8.7	—	ns		

Notes: 8. Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ ; duty cycle  $\leq 2\%$   
9. For design aid only, not subject to production testing.  
10. Switching characteristics are independent of operating junction temperatures.

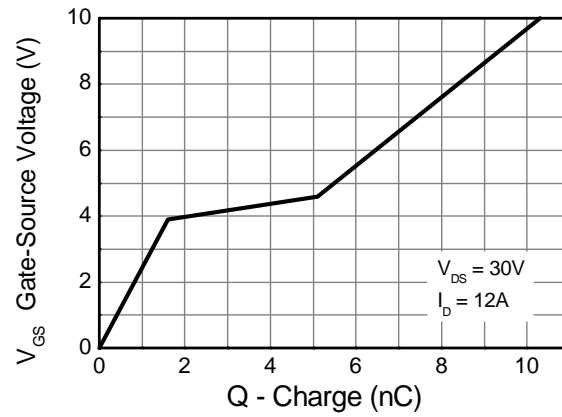
## Typical Characteristics



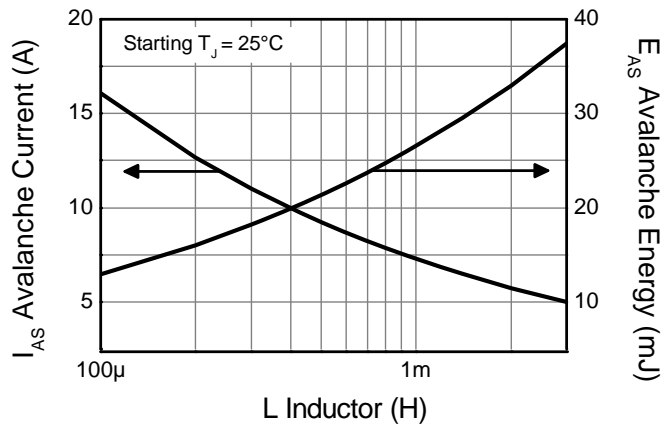
## Typical Characteristics - continued



**Capacitance v Drain-Source Voltage**

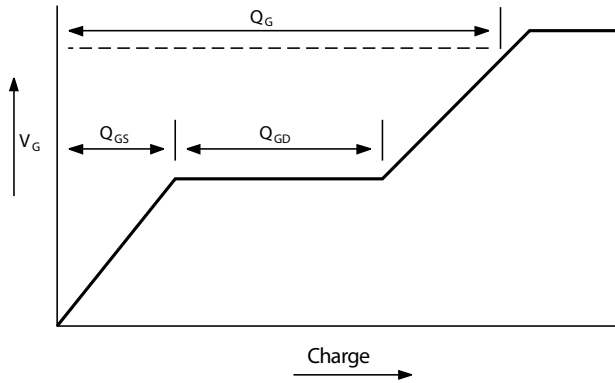


**Gate-Source Voltage v Gate Charge**

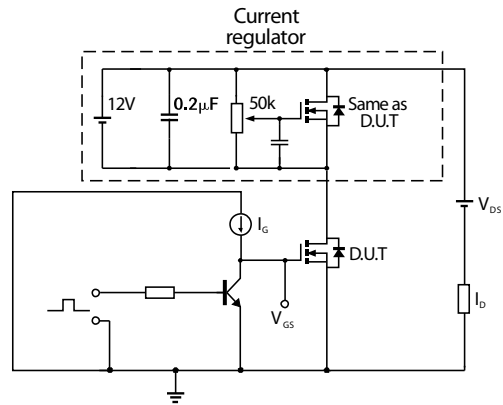


**Single-Pulsed Avalanche Rating**

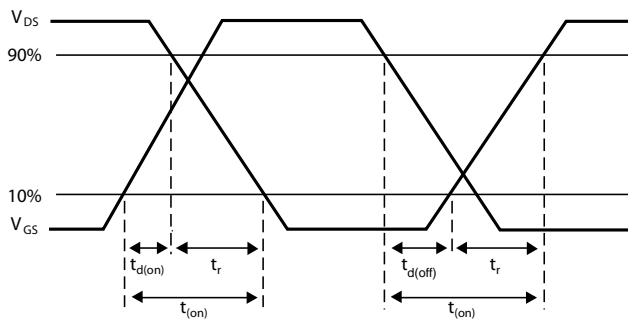
## Test Circuits



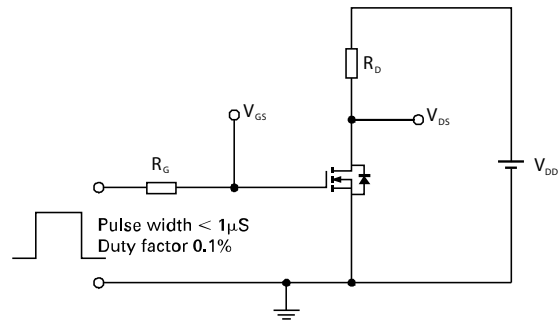
**Basic gate charge waveform**



**Gate charge test circuit**

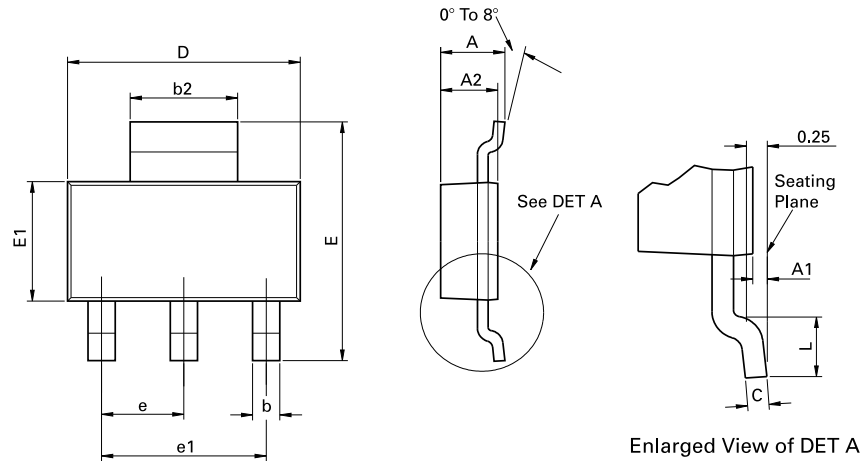


**Switching time waveforms**



**Switching time test circuit**

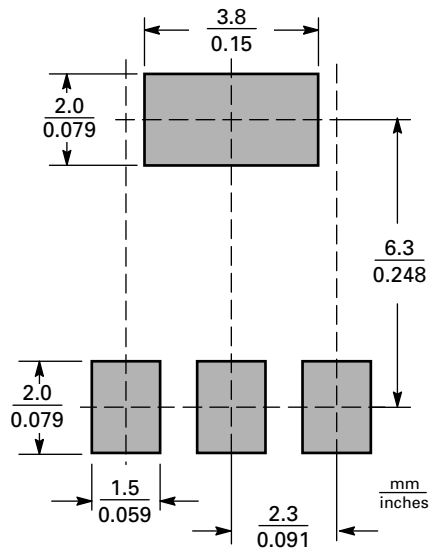
## Package Outline Dimensions



Conforms to JEDEC TO-261 AA Issue B

DIM	Millimeters		Inches		DIM	Millimeters		Inches	
	Min	Max	Min	Max		Min	Max	Min	Max
A	-	1.80	-	0.071	D	6.30	6.70	0.248	0.264
A1	0.02	0.10	0.0008	0.004	e	2.30 BSC		0.0905 BSC	
A2	1.55	1.65	0.0610	0.0649	e1	4.60 BSC		0.181 BSC	
b	0.66	0.84	0.026	0.033	E	6.70	7.30	0.264	0.287
b2	2.90	3.10	0.114	0.122	E1	3.30	3.70	0.130	0.146
C	0.23	0.33	0.009	0.013	L	0.90	-	0.355	-

## Suggested Pad Layout





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