

60V N-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

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

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

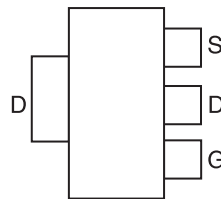
Mechanical Data

- 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)

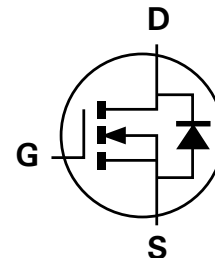
SOT223



Top View



Pin Out - Top View



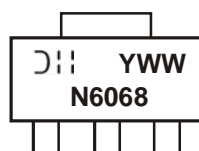
Equivalent Circuit

Ordering Information (Note 1)

Product	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
DMN6068SE-13	N6068	13	12	4,000

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



$\text{D}||$ = Manufacturer's Marking
 N6068 = Product Type Marking Code
 YWW = Date Code Marking
 Y = Year (ex: 9 = 2009)
 WW = Week (01 - 53)

Maximum Ratings @ $T_A = 25^\circ\text{C}$ unless otherwise specified

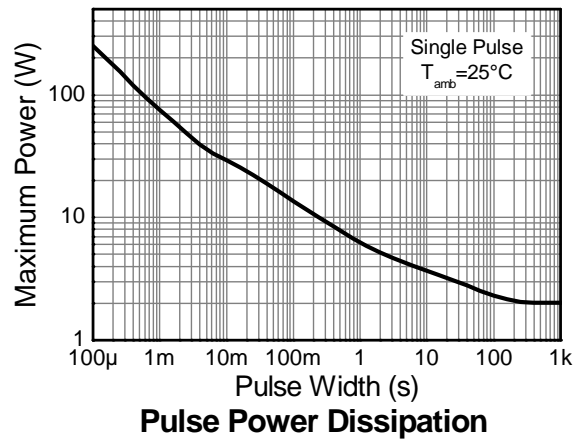
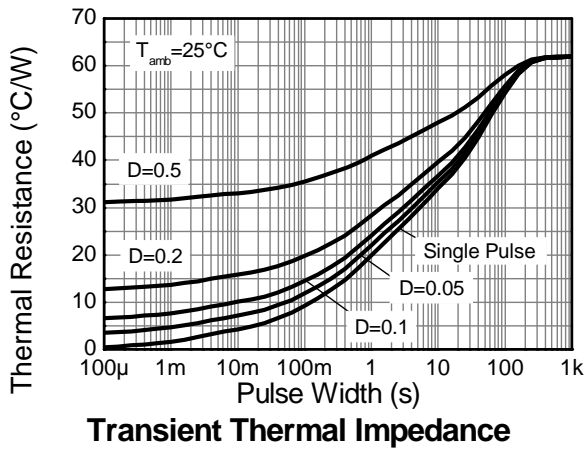
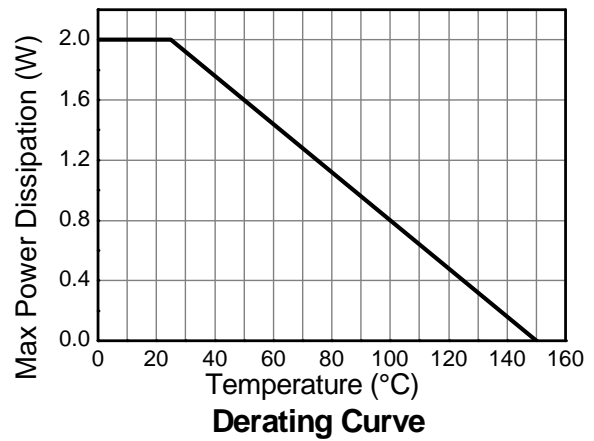
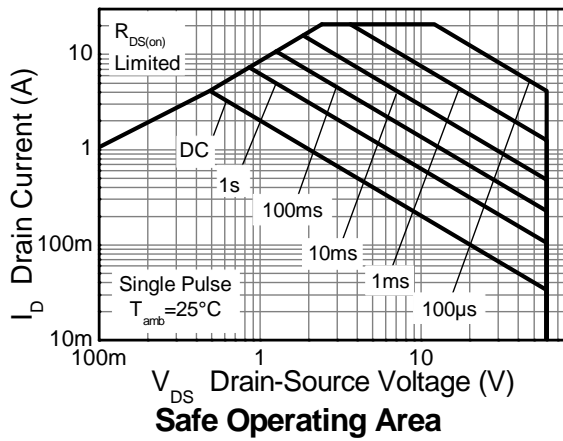
Characteristic		Symbol	Value	Unit	
Drain-Source voltage		V_{DSS}	60	V	
Gate-Source voltage	(Note 2)	V_{GS}	± 20	V	
Single Pulsed Avalanche Energy		E_{AS}	37.5	mJ	
Single Pulsed Avalanche Current		I_{AS}	5.0	A	
Continuous Drain current	$V_{GS} = 10\text{V}$	I_D	(Note 4)	5.6	A
	$T_A = 70^\circ\text{C}$ (Note 4)		4.5		
	(Note 3)		4.1		
Pulsed Drain current	$V_{GS} = 10\text{V}$	I_{DM}	20.8	A	
Continuous Source current (Body diode)		I_S	4.9	A	
Pulsed Source current (Body diode)		I_{SM}	20.8	A	

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

Characteristic		Symbol	Value	Unit
Power dissipation	(Note 3)	P_D	2.0	W
			16.0	
Linear derating factor	(Note 4)		3.7	mW/ $^\circ\text{C}$
			29.5	
Thermal Resistance, Junction to Ambient	(Note 3)	$R_{\theta JA}$	62.5	$^\circ\text{C}/\text{W}$
	(Note 4)		34	
Thermal Resistance, Junction to Lead	(Note 6)	$R_{\theta JL}$	11.5	$^\circ\text{C}/\text{W}$
Operating and storage temperature range		T_J, T_{STG}	-55 to 150	$^\circ\text{C}$

- Notes:
- AEC-Q101 V_{GS} maximum is $\pm 16\text{V}$.
 - 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 $t \leq 10$ 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 $L = 3.0\text{mH}$, $I_{AS} = 5.0\text{A}$, $R_G = 25\Omega$, $V_{DD} = 50\text{V}$, starting $T_J = 25^\circ\text{C}$.

Thermal Characteristics

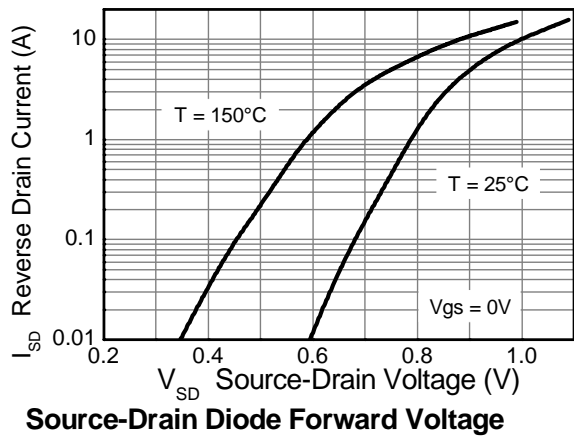
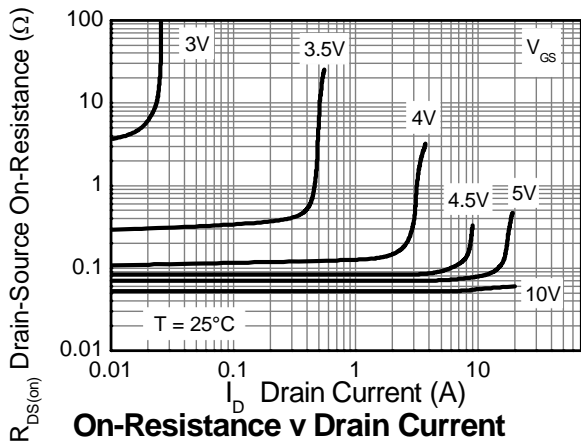
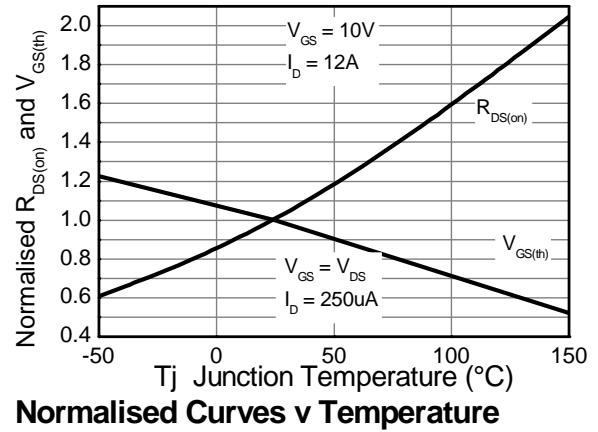
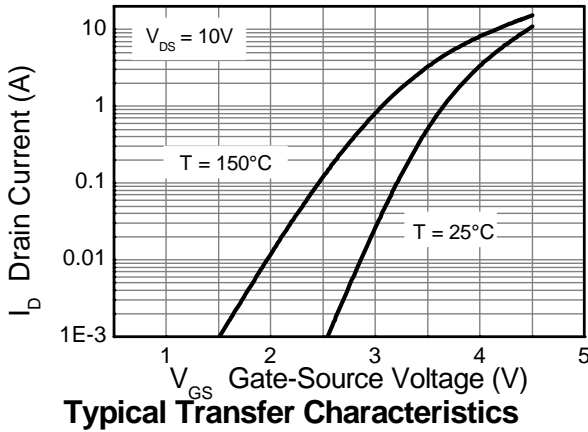
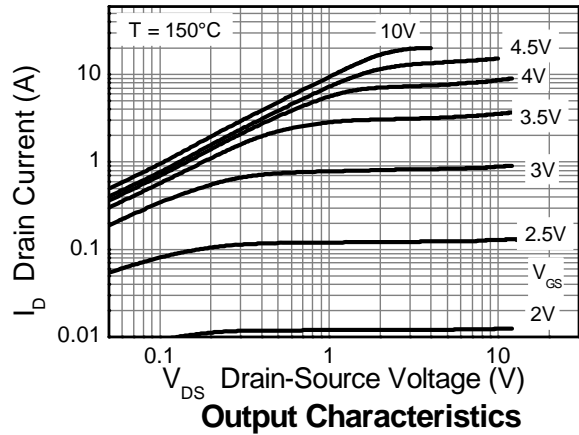
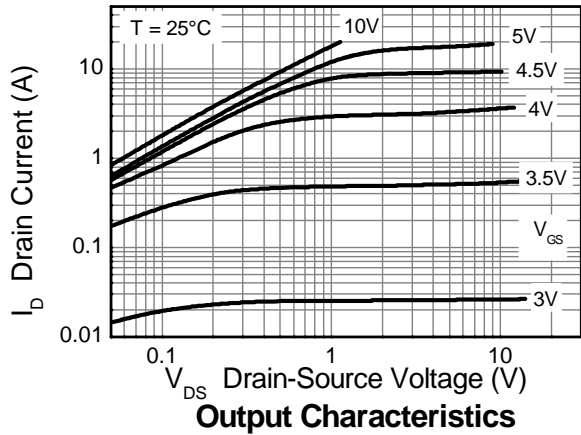


Electrical Characteristics @ $T_A = 25^\circ\text{C}$ unless otherwise specified

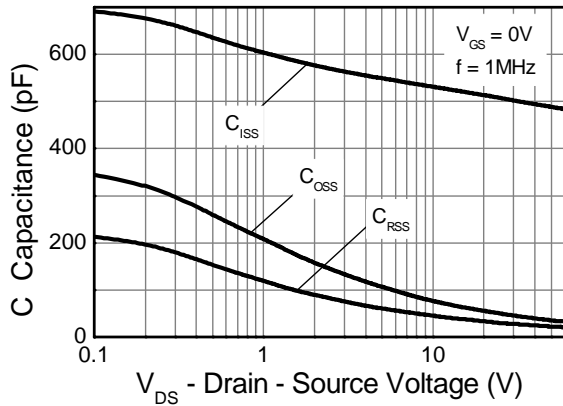
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	60	—	—	V	$I_D = 250\mu\text{A}$, $V_{GS} = 0\text{V}$
Zero Gate Voltage Drain Current	I_{DSS}	—	—	0.5	μA	$V_{DS} = 60\text{V}$, $V_{GS} = 0\text{V}$
Gate-Source Leakage	I_{GSS}	—	—	± 100	nA	$V_{GS} = \pm 20\text{V}$, $V_{DS} = 0\text{V}$
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(th)}$	1.0	—	3.0	V	$I_D = 250\mu\text{A}$, $V_{DS} = V_{GS}$
Static Drain-Source On-Resistance (Note 8)	$R_{DS(on)}$	—	—	0.068	Ω	$V_{GS} = 10\text{V}$, $I_D = 12\text{A}$
				0.100		$V_{GS} = 4.5\text{V}$, $I_D = 6\text{A}$
Forward Transconductance (Notes 8 & 9)	g_{fs}	—	19.7	—	S	$V_{DS} = 15\text{V}$, $I_D = 12\text{A}$
Diode Forward Voltage (Note 8)	V_{SD}	—	0.98	1.15	V	$I_S = 12\text{A}$, $V_{GS} = 0\text{V}$
Reverse recovery time (Note 9)	t_{rr}	—	145	—	ns	$I_S = 12\text{A}$, $di/dt = 100\text{A}/\mu\text{s}$
Reverse recovery charge (Note 9)	Q_{rr}	—	929	—	nC	
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{iss}	—	502	—	pF	$V_{DS} = 30\text{V}$, $V_{GS} = 0\text{V}$ $f = 1\text{MHz}$
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	$V_{GS} = 4.5\text{V}$
Total Gate Charge (Note 10)	Q_g	—	10.3	—	nC	$V_{GS} = 10\text{V}$
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	$V_{DD} = 30\text{V}$, $V_{GS} = 10\text{V}$ $I_D = 12\text{A}$, $R_G \cong 6.0\Omega$
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.

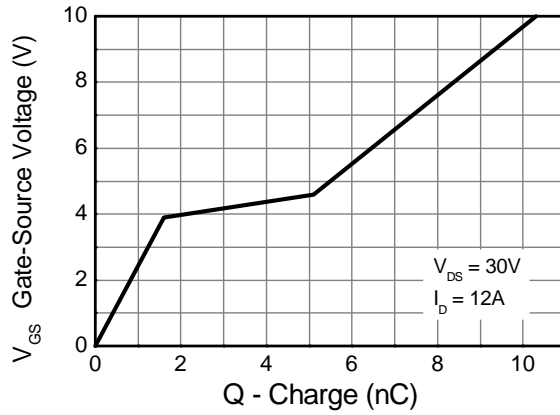
Typical Characteristics



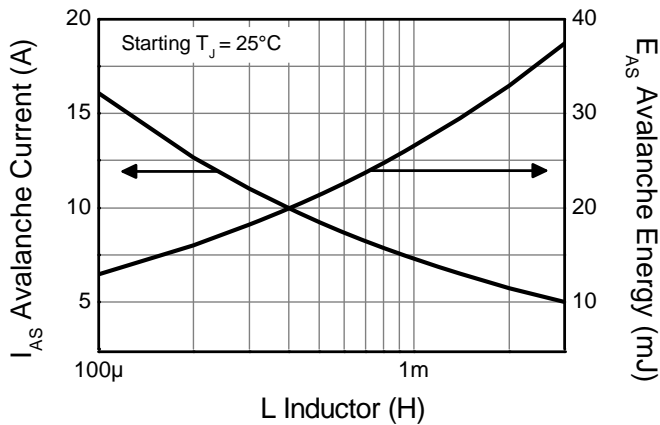
Typical Characteristics - continued



Capacitance v Drain-Source Voltage

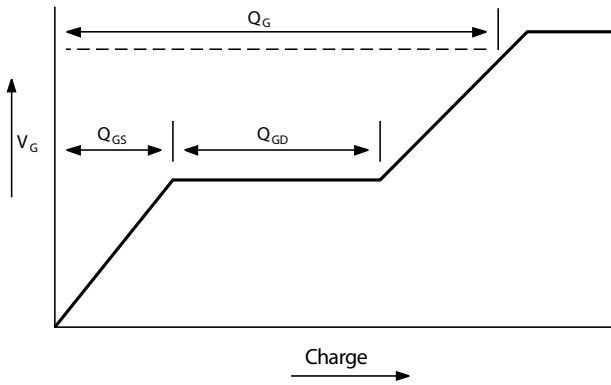


Gate-Source Voltage v Gate Charge

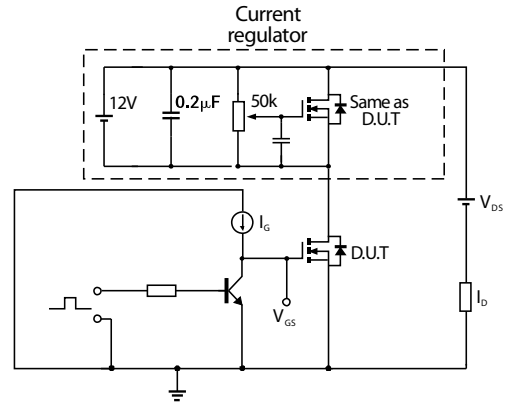


Single-Pulsed Avalanche Rating

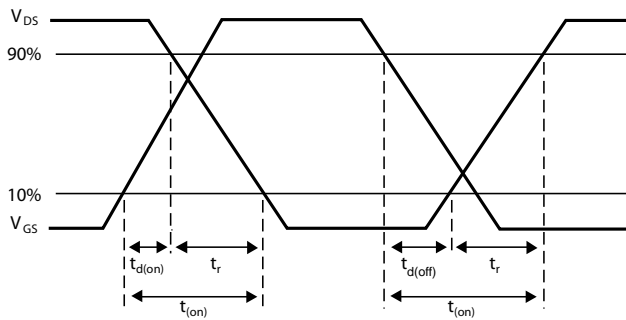
Test Circuits



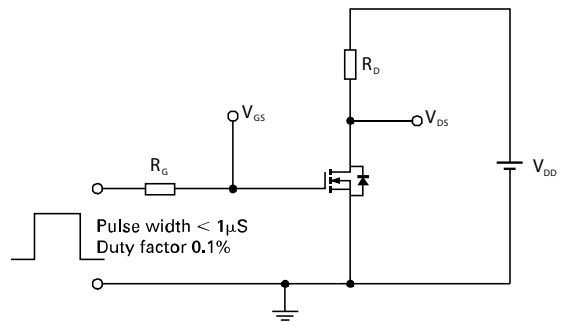
Basic gate charge waveform



Gate charge test circuit

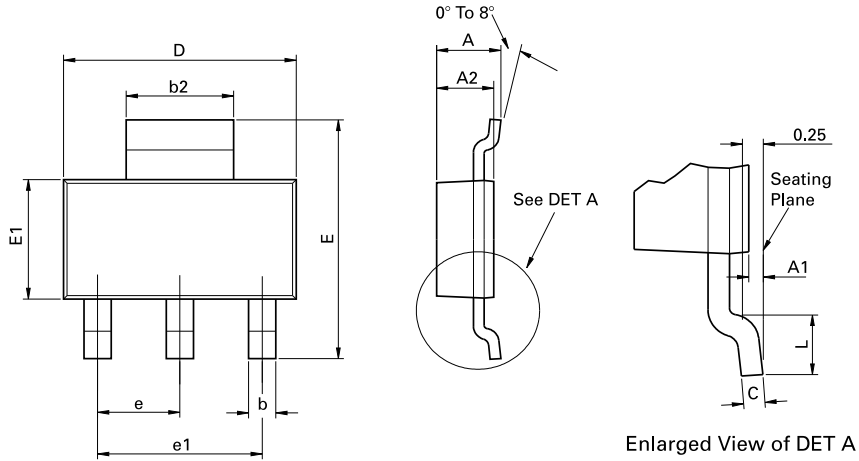


Switching time waveforms



Switching time test circuit

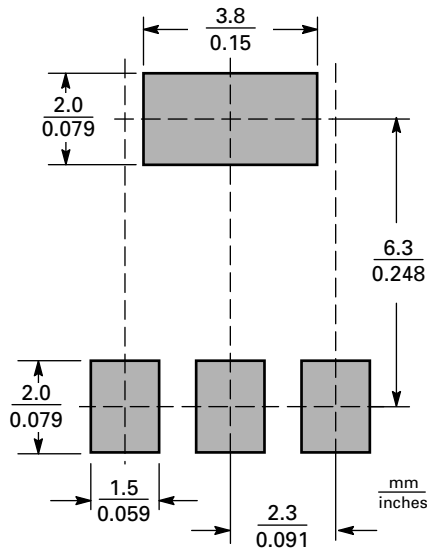
Package Outline Dimensions



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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