60V DUAL N-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

BV_{DSS}	$R_{DS(ON)}$ Max	I_D MAX T_A = +25°C
60V	120mΩ @ V_{GS} = 10V	3.2A
	180mΩ @ V_{GS} = 4.5V	2.6A

Features and Benefits

- Low On-Resistance
- Fast Switching Speed
- Low Threshold
- Low Gate Drive
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

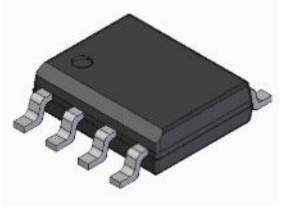
Description and Applications

This new generation MOSFET is 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.

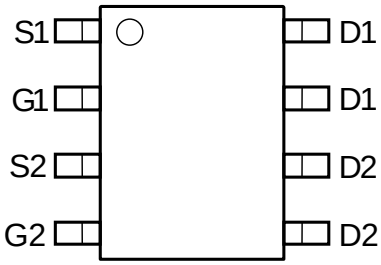
- DC-DC Converters
- Power Management Functions
- Motor Control

Mechanical Data

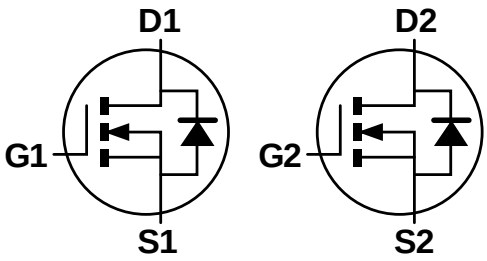
- Case: SO-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram
- Terminals: Finish – Tin Finish Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.074 grams (Approximate)



Top View



Top View
Pin Configuration



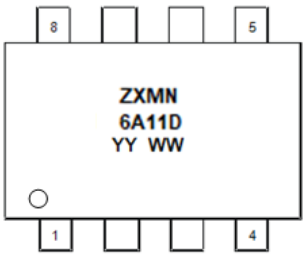
Equivalent Circuit

Ordering Information (Note 4)

Part Number	Case	Packaging
ZXMN6A11DN8TA	SO-8	2,500/Tape & Reel

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See https://www.diodes.com/quality/lead-free/ 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 https://www.diodes.com/design/support/packaging/diodes-packaging/.

Marking Information



ZXMN6A11D = Product Type Marking Code
YYWW = Date Code Marking
YY = Year (ex: 19 = 2019)
WW = Week (01 to 53)

Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DSS}	60	V
Gate-Source Voltage			V_{GSS}	±20	V
Continuous Drain Current (V_{GS} = 10V)	Steady State t<10s	T_A = +25°C (Note 6) T_A = +70°C (Note 6) T_A = +25°C (Note 5)	I_D	3.2 2.6 2.5	A
Maximum Body Diode Forward Current (Note 6)			I_S	3.1	A
Pulsed Drain Current (Note 7)			I_{DM}	13.7	A
Pulsed Body Diode Forward Current ((Note 7)			I_{SM}	13.7	A

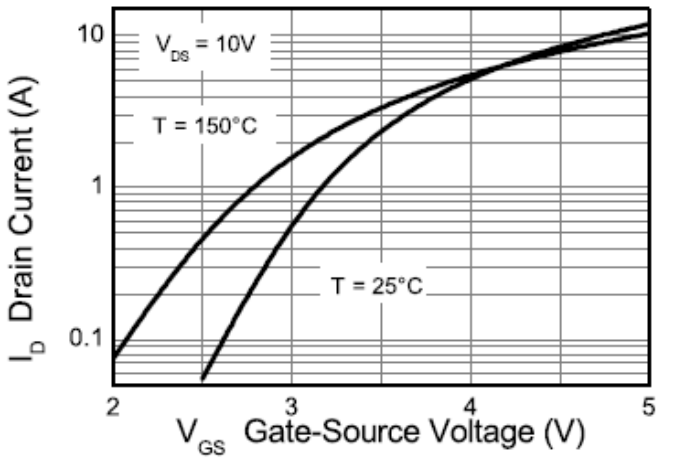
Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Total Power Dissipation (Note 5 & Note 8)	P_D	1.25	W
Thermal Resistance, Junction to Ambient (Note 5 & Note 8)	$R_{\theta JA}$	100	°C/W
Total Power Dissipation(Note 5 & Note 9)	P_D	1.8	W
Thermal Resistance, Junction to Ambient (Note 5 & Note 9)	$R_{\theta JA}$	70	°C/W
Total Power Dissipation (Note 6 & Note 8)	P_D	2.1	W
Thermal Resistance, Junction to Ambient (Note 6 & Note 8)	$R_{\theta JA}$	60	°C/W
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +150	°C

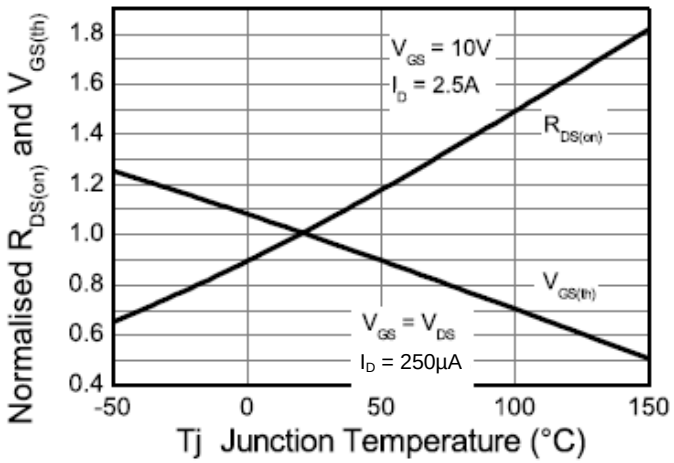
Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 10)						
Drain-Source Breakdown Voltage	BV_{DSS}	60	—	—	V	V_{GS} = 0V, I_D = 250µA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1	µA	V_{DS} = 60V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS (Note 10)						
Gate Threshold Voltage	$V_{GS(TH)}$	1	—	—	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	—	120	mΩ	V_{GS} = 10V, I_D = 2.5A
		—	—	180		V_{GS} = 4.5V, I_D = 2A
Forward Transconductance	gfs	—	4.9	—	S	V_{DS} = 15V, I_D = 2.5A
Diode Forward Voltage	V_{SD}	—	0.85	0.95	V	T_J = +25°C, V_{GS} = 0V, I_S = 2.8A
DYNAMIC CHARACTERISTICS (Note 11)						
Input Capacitance	C_{iss}	—	330	—	pF	V_{DS} = 40V, V_{GS} = 0V f = 1.0MHz
Output Capacitance	C_{oss}	—	35.2	—		
Reverse Transfer Capacitance	C_{rss}	—	17.1	—		
Total Gate Charge (V_{GS} = 10V)	Q_g	—	5.7	—	nC	V_{DS} = 15V, I_D = 2.5A
Total Gate Charge (V_{GS} = 5V)	Q_g	—	3	—		
Gate-Source Charge	Q_{gs}	—	1.25	—		
Gate-Drain Charge	Q_{gd}	—	0.86	—		
Turn-On Delay Time	$t_{D(ON)}$	—	1.95	—	ns	V_{GS} = 10V, V_{DD} = 30V, R_g = 6Ω, I_D = 2.5A
Turn-On Rise Time	t_R	—	3.5	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	8.2	—		
Turn-Off Fall Time	t_F	—	4.6	—		
Body Diode Reverse Recovery Time	t_{RR}	—	21.5	—	ns	T_J = +25°C, I_S = 2.5A, di/dt = 100A/µs
Body Diode Reverse Recovery Charge	Q_{RR}	—	20.5	—	nC	T_J = +25°C, I_S = 2.5A, di/dt = 100A/µs

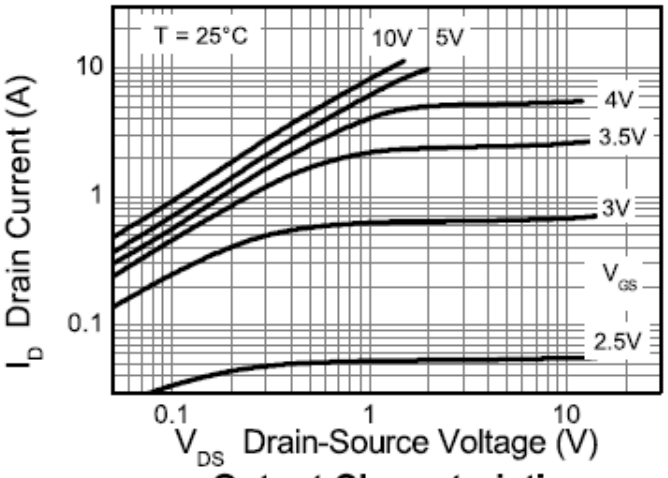
Notes:
5. For a device surface mounted on 25mm x 25mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions.
6. For a device surface mounted on FR4 PCB.
7. Repetitive rating - 25mm x 25mm FR4 PCB, D=0.02, pulse width 300µs - pulse width limited by maximum junction temperature.
8. For a dual device with one active die.
9. For a device with two active dice running at equal power.
10. Short duration pulse test used to minimize self-heating effect.
11. Guaranteed by design. Not subject to product testing.



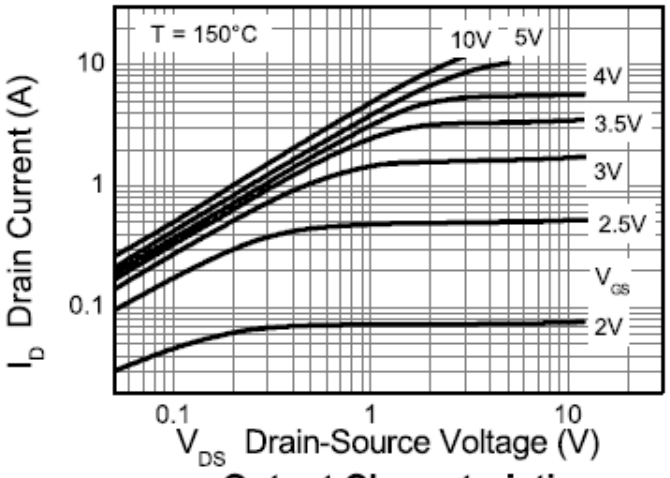
Typical Transfer Characteristics



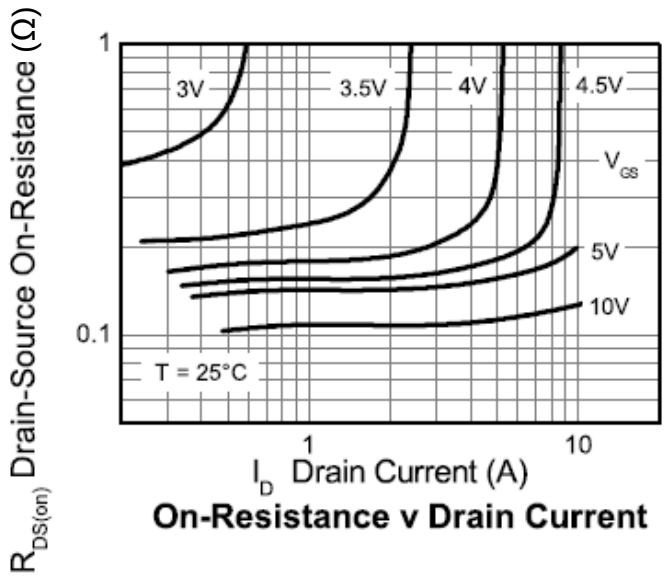
Normalised Curves v Temperature



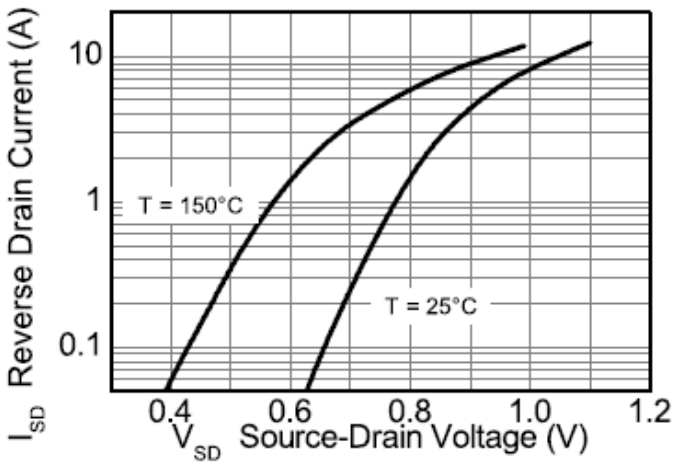
Output Characteristics



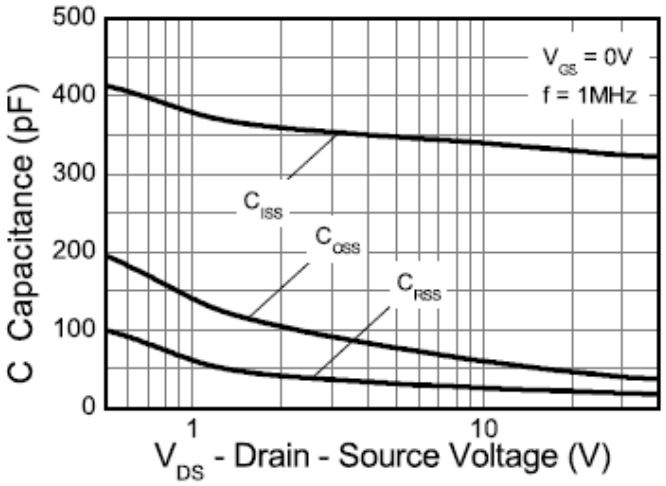
Output Characteristics



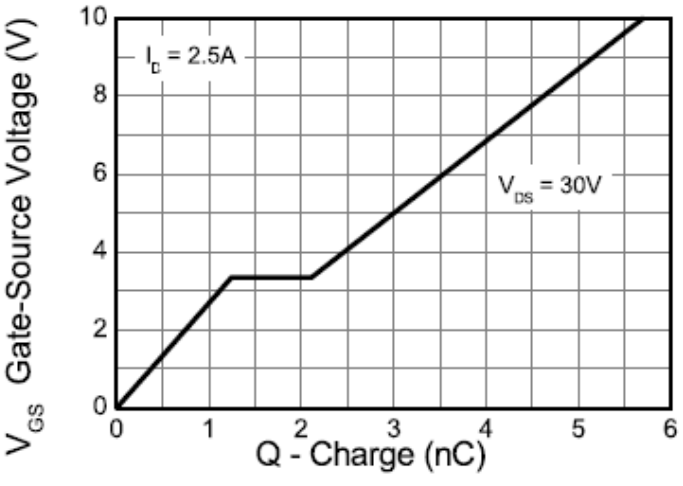
On-Resistance v Drain Current



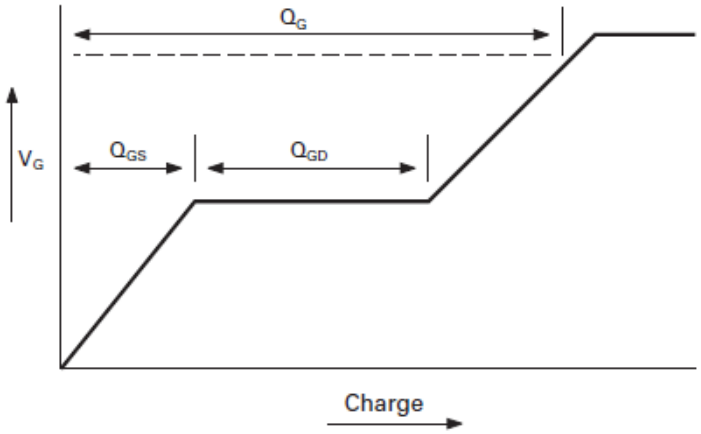
Source-Drain Diode Forward Voltage



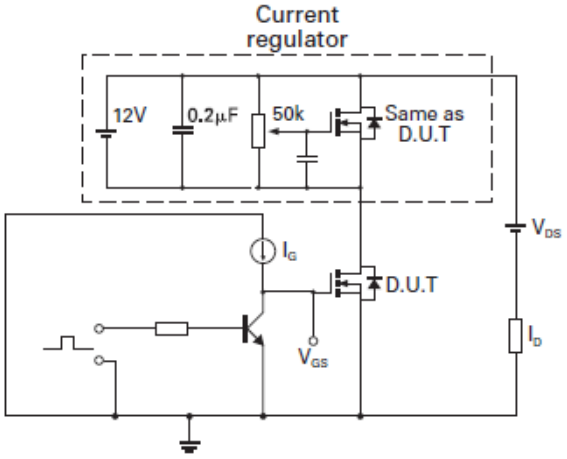
Capacitance v Drain-Source Voltage



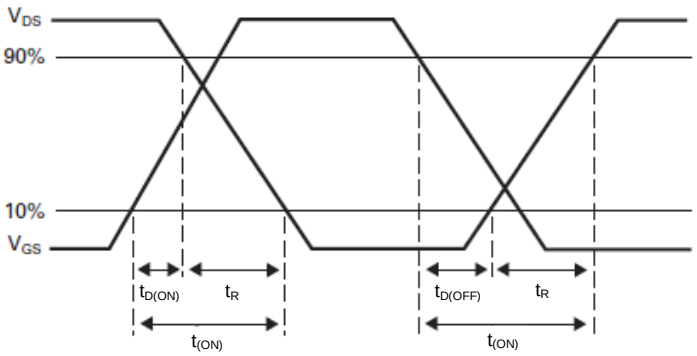
Gate-Source Voltage v Gate Charge



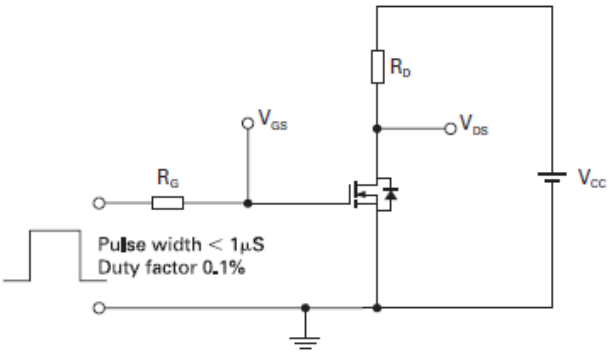
Basic gate charge waveform



Gate charge test circuit



Switching time waveforms

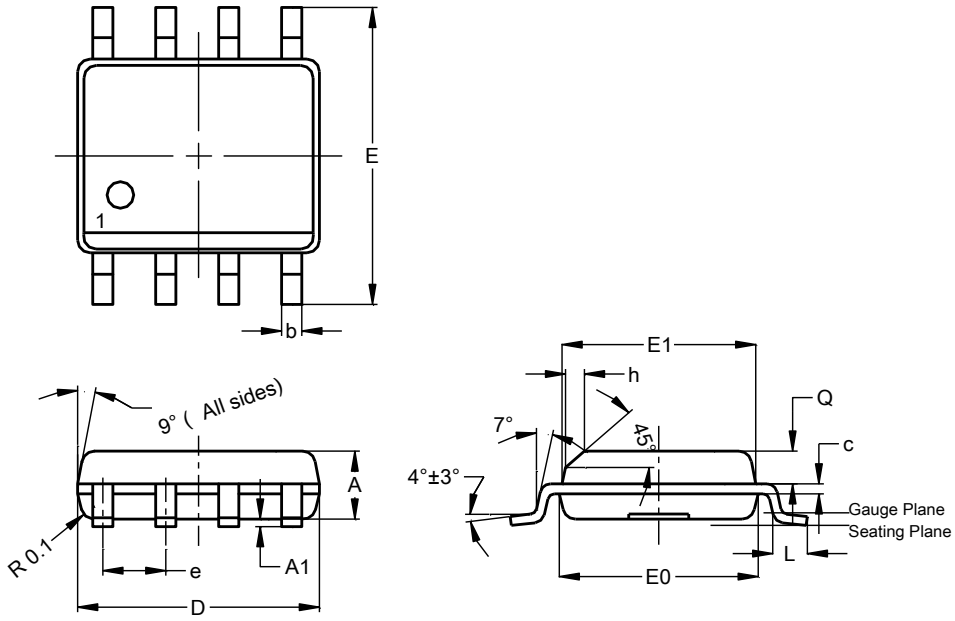


Switching time test circuit

Package Outline Dimensions

Please see http://www.diodes.com/package-outlines.html for the latest version.

SO-8

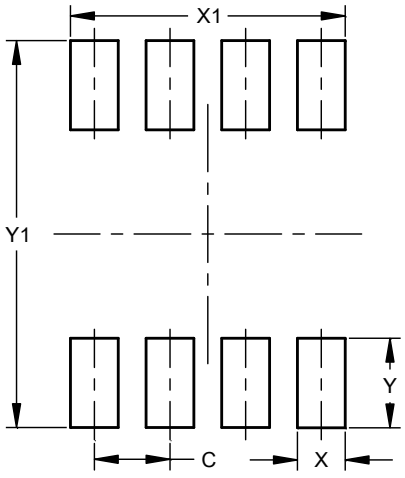


SO-8			
Dim	**Min**	**Max**	**Typ**
A	1.40	1.50	1.45
A1	0.10	0.20	0.15
b	0.30	0.50	0.40
c	0.15	0.25	0.20
D	4.85	4.95	4.90
E	5.90	6.10	6.00
E1	3.80	3.90	3.85
E0	3.85	3.95	3.90
e	--	--	1.27
h	--	--	0.35
L	0.62	0.82	0.72
Q	0.60	0.70	0.65
All Dimensions in mm			

Suggested Pad Layout

Please see http://www.diodes.com/package-outlines.html for the latest version.

SO-8



Dimensions	Value (in mm)
C	1.27
X	0.802
X1	4.612
Y	1.505
Y1	6.50

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