

Product Summary

- Continuous Drain-Source Voltage 60V
- On-State Resistance 700mΩ
- Nominal Load Current ($V_{IN} = 5V$) 1.1A
- Clamping Energy 210mJ

Description

The ZXMS6008N8 is a self-protected low-side IntelliFET® MOSFET with logic-level input. It integrates overtemperature, overcurrent, overvoltage (active clamp) and ESD protected logic-level functionality. The ZXMS6008N8 is ideal as a general-purpose switch driven from 3.3V or 5V microcontrollers in harsh environments where standard MOSFETs are not rugged enough.

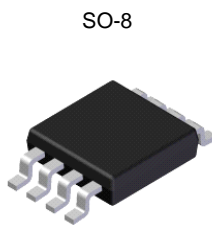
- Lamp drivers
- Motor drivers
- Relay drivers
- Solenoid drivers

Features and Benefits

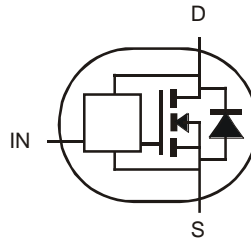
- Compact High Power Dissipation Package
- Low Input Current
- Logic-Level Input (3.3V and 5V)
- Short-Circuit Protection with Auto Restart
- Overvoltage Protection (Active Clamp)
- Thermal Shutdown with Auto Restart
- Overcurrent Protection
- Input Protection (ESD)
- High Continuous Current Rating
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **This part is qualified to JEDEC standards (as references in AEC-Q) for High Reliability.**
<https://www.diodes.com/quality/product-definitions/>
- **An automotive-compliant part is available under separate datasheet (ZXMS6008N8Q)**

Mechanical Data

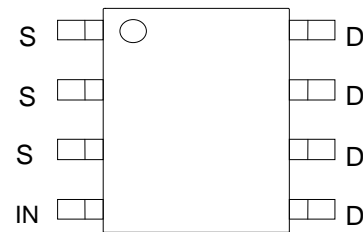
- Package: SO-8
- Package Material: Molded Plastic, "Green" Molding Compound
UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish Ⓔ3
- Weight: 0.117 grams (Approximate)



Top View



Device Symbol



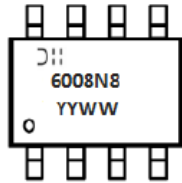
Top View
Pin-Out

Ordering Information (Note 4)

Part Number	Package	Marking	Reel Size (inches)	Tape Width (mm)	Packing	
					Qty.	Carrier
ZXMS6008N8-13	SO-8	6008N8	13	12	2,500	Reel

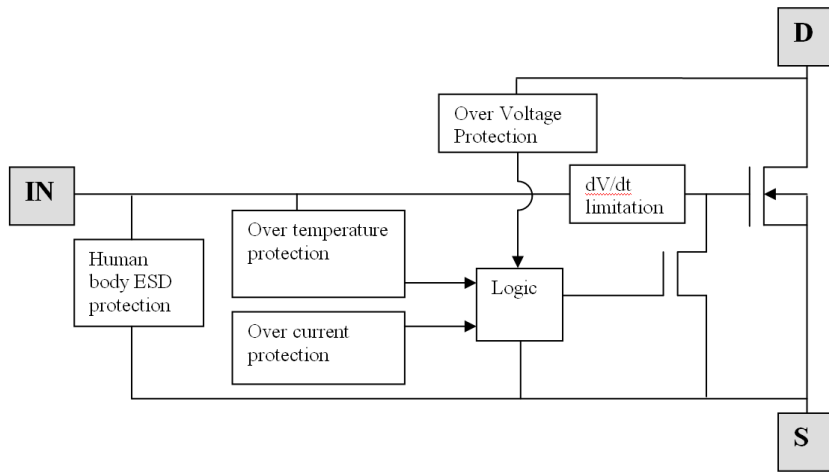
- Notes:
1. EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant. All applicable RoHS exemptions applied.
 2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 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



DII = Manufacturer's Marking
 6008N8 = Product Type Marking Code
 YYWW = Date Code Marking
 YY: Last Two Digits of Year (ex: 23 = 2023)
 WW: Week 01 to 52
 52 Represents Week 52 and 53

Functional Block Diagram



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

Characteristic	Symbol	Value	Units
Continuous Drain-Source Voltage	V _{DS}	60	V
Drain-Source Voltage for Short-Circuit Protection	V _{DS(SC)}	36	V
Continuous Input Voltage	V _{IN}	-0.5 to +6	V
Continuous Input Current @ -0.2V ≤ V _{IN} ≤ 6V	I _{IN}	No Limit	mA
Continuous Input Current @ V _{IN} < -0.2V or V _{IN} > 6V		I _{IN} ≤ 2	
Pulsed Drain Current @ V _{IN} = 3.3V	I _{DM}	1.4	A
Pulsed Drain Current @ V _{IN} = 5V	I _{DM}	1.8	A
Continuous Source Current (Body Diode) (Note 5)	I _S	0.7	A
Pulsed Source Current (Body Diode)	I _{SM}	3.5	A
Unclamped Single Pulse Inductive Energy T _J = +25°C, I _D = 0.5A, V _{DD} = 24V	E _{AS}	210	mJ
Electrostatic Discharge (Human Body Model)	V _{ESD}	4000	V
Charged Device Model	V _{CDM}	1000	V

Note: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.

Thermal Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Characteristic	Symbol	Value	Units
Power Dissipation at $T_A = +25^\circ\text{C}$ (Note 5)	P_D	1.15	W
Linear Derating Factor		9.2	mW/ $^\circ\text{C}$
Power Dissipation at $T_A = +25^\circ\text{C}$ (Note 6)	P_D	1.98	W
Linear Derating Factor		15.84	mW/ $^\circ\text{C}$
Thermal Resistance, Junction to Ambient (Note 5)	$R_{\theta JA}$	109.9	$^\circ\text{C/W}$
Thermal Resistance, Junction to Ambient (Note 6)	$R_{\theta JA}$	63.7	$^\circ\text{C/W}$
Thermal Resistance, Junction to Case (Note 7)	$R_{\theta JC}$	11.3	$^\circ\text{C/W}$
Operating Temperature Range	T_J	-40 to +150	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	-55 to +150	$^\circ\text{C}$

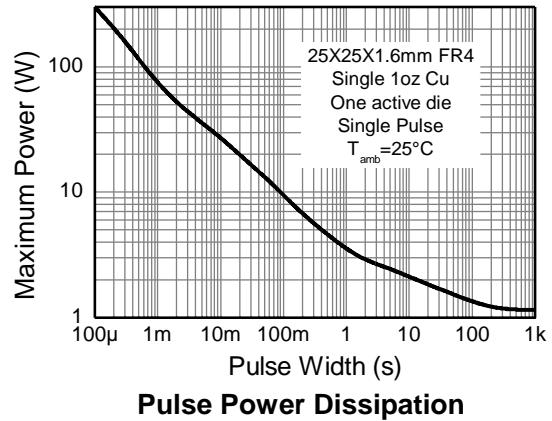
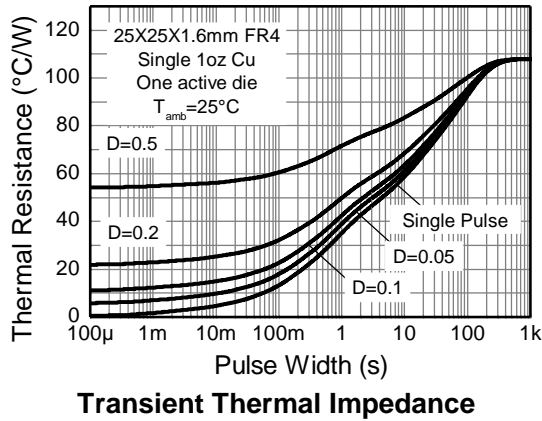
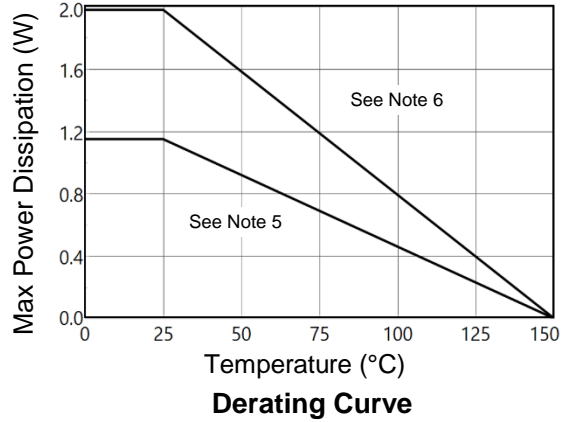
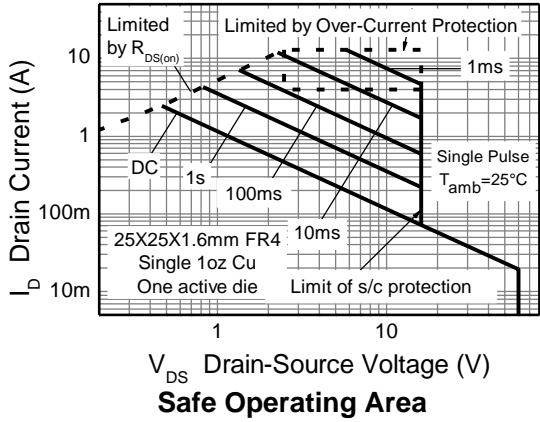
Notes: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
6. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
7. Thermal resistance between junction and the mounting surfaces of drain and source pins.

Recommended Operating Conditions

The ZXMS6008N8 is optimized for use with μC operating from 3.3V and 5V supplies.

Characteristic	Symbol	Min	Max	Unit
Input Voltage Range	V_{IN}	0	5.5	V
Ambient Temperature Range	T_A	-40	+125	$^\circ\text{C}$
High-Level Input Voltage for MOSFET to Be On	V_{IH}	3	5.5	V
Low-Level Input Voltage for MOSFET to Be Off	V_{IL}	0	0.7	V
Peripheral Supply Voltage (Voltage to Which Load is Referred)	V_P	0	16	V

Thermal Characteristics

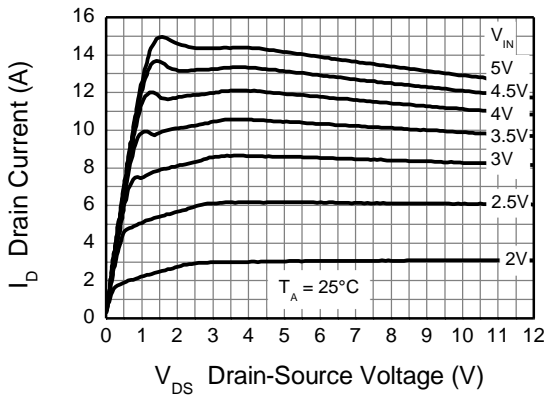


Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

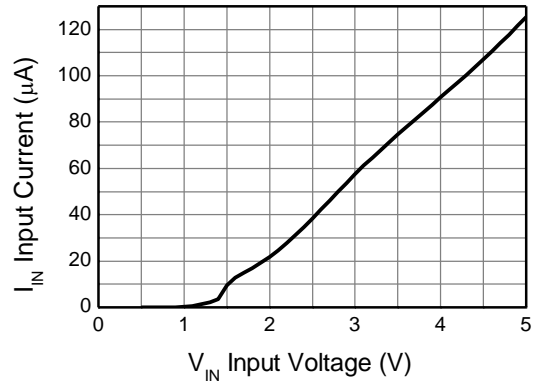
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Static Characteristics						
Drain-Source Clamp Voltage	V _{DS(AZ)}	60	65	70	V	I _D = 10mA
Off-State Drain Current	I _{DSS}	—	—	1	μA	V _{DS} = 12V, V _{IN} = 0V
		—	—	2		V _{DS} = 36V, V _{IN} = 0V
Input Threshold Voltage	V _{IN(th)}	0.7	1.2	1.5	V	V _{DS} = V _{GS} , I _D = 1mA
Input Current	I _{IN}	—	60	100	μA	V _{IN} = +3V
		—	120	200		V _{IN} = +5V
Input Current While Overtemperature Active	—	—	—	350	μA	V _{IN} = +5V
Static Drain-Source On-State Resistance	R _{DS(on)}	—	550	800	mΩ	V _{IN} = +3V, I _D = 1A
		—	500	700		V _{IN} = +5V, I _D = 1A
Continuous Drain Current (Note 5)	I _D	0.6	—	—	A	V _{IN} = 3V, T _A = +25°C
		0.7	—	—		V _{IN} = 5V, T _A = +25°C
Continuous Drain Current (Note 6)		0.8	—	—		V _{IN} = 3V, T _A = +25°C
		0.9	—	—		V _{IN} = 5V, T _A = +25°C
Current Limit (Note 8)	I _{D(LIM)}	0.5	1.2	—	A	V _{IN} = +3V
		0.7	1.6	—		V _{IN} = +5V
Dynamic Characteristics						
Turn On Delay Time	t _{d(on)}	—	5	—	μs	V _{DD} = 12V, I _D = 1A, V _{GS} = 5V
Rise Time	t _r	—	10	—	μs	
Turn Off Delay Time	t _{d(off)}	—	45	—	μs	
Fall Time	t _f	—	15	—	μs	
Overtemperature Protection						
Thermal Overload Trip Temperature (Note 9)	T _{JT}	+150	+175	—	°C	—
Thermal Hysteresis (Note 9)	ΔT _{JT}	—	+10	—	°C	—

- Notes:
- The drain current is restricted only when the device is in saturation (see graph *Typical Output Characteristic*). This allows the device to be used in the fully on state without interference from the current limit. The device is fully protected at all drain currents, as the low power dissipation generated outside saturation makes current limit unnecessary.
 - Overtemperature protection is designed to prevent device destruction under fault conditions. Fault conditions are considered as "outside" normal operating range, so this part is not designed to withstand overtemperature for extended periods.

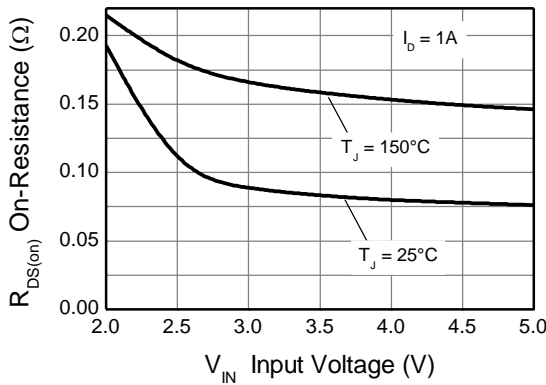
Typical Characteristics



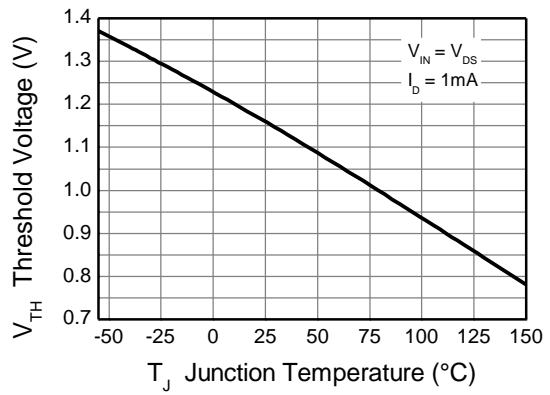
Typical Output Characteristic



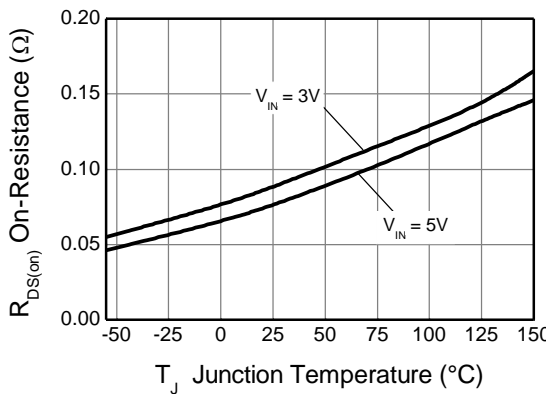
Input Current vs Input Voltage



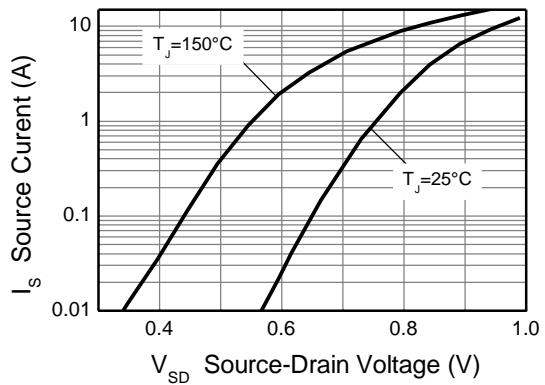
On-Resistance vs Input Voltage



Threshold Voltage vs Temperature

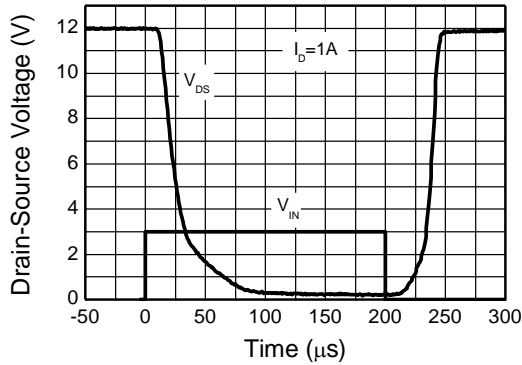


On-Resistance vs Temperature

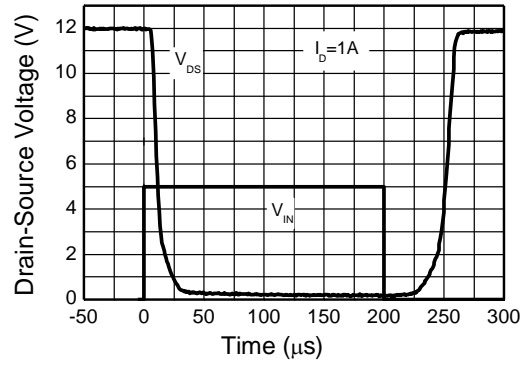


Reverse Diode Characteristic

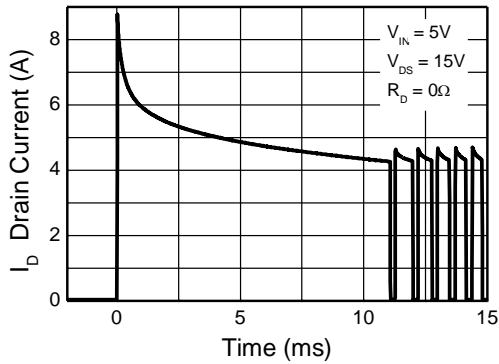
Typical Characteristics (continued)



Switching Speed



Switching Speed

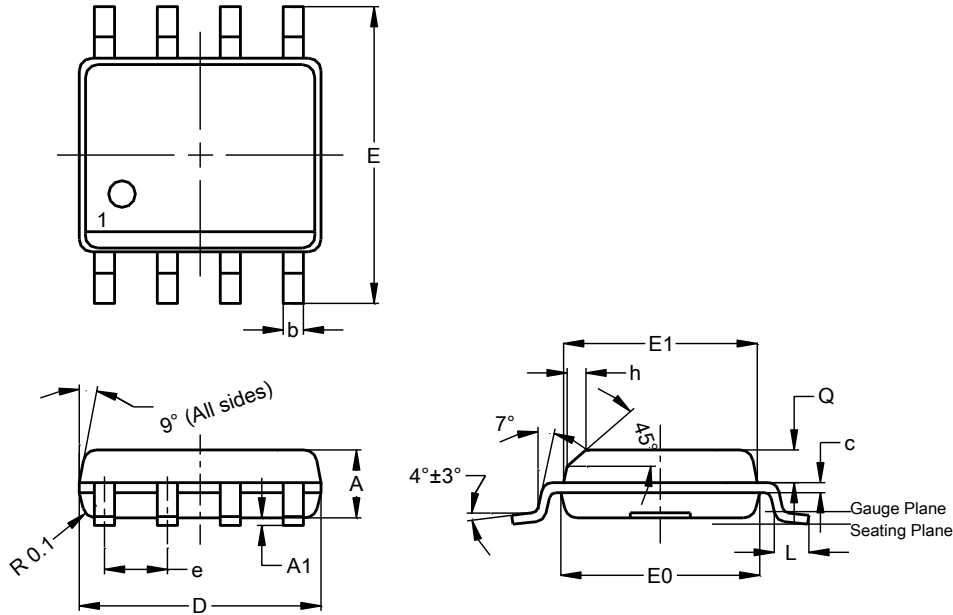


Typical Short Circuit Protection

Package Outline Dimensions

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

SO-8

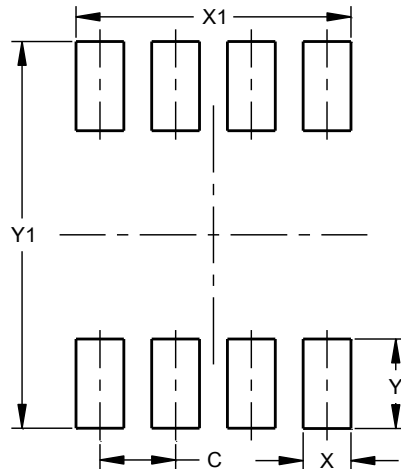


SO-8			
Dim	Min	Max	Typ
A	1.40	1.50	1.45
A1	0.10	0.20	0.15
b	0.30	0.50	0.40
c	0.15	0.25	0.20
D	4.85	4.95	4.90
E	5.90	6.10	6.00
E1	3.80	3.90	3.85
E0	3.85	3.95	3.90
e	--	--	1.27
h	-	--	0.35
L	0.62	0.82	0.72
Q	0.60	0.70	0.65
All Dimensions in mm			

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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