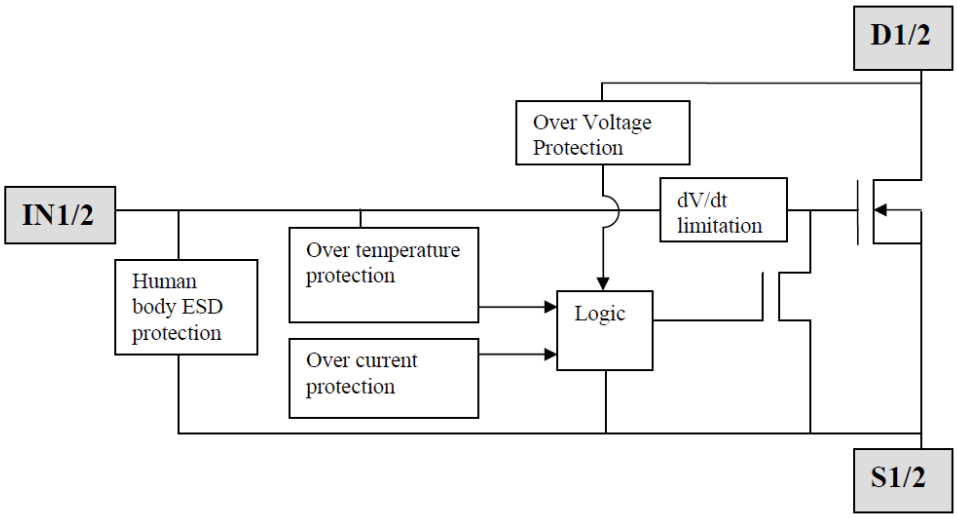
Functional Block Diagram



Application Information

- Two Completely Isolated Independent Channels
- Especially Suited for loads with a High In-Rush Current such as Lamps and Motors
- All Types of Resistive, Inductive and Capacitive Loads in Switching Applications
- µC Compatible Power Switch for 12V and 24V DC Applications
- Replaces Electromechanical Relays and Discrete Circuits
- Linear Mode Capability — the current-limiting protection circuitry is designed to deactivate at low V_{DS} to minimize on-state power dissipation The maximum DC operating current is therefore determined by the thermal capability of the package or board combination, rather than by the protection circuitry. This does not compromise the product's ability to self-protect at low V_{DS}.

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

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 Continuous Input Current @V_{IN} < -0.2V or V_{IN} > 6V	I_{IN}	No limit $\lvert I_{IN} \rvert$ ≤2	mA
Pulsed Drain Current @V_{IN} = 3.3V	I_{DM}	2	A
Pulsed Drain Current @V_{IN} = 5V	I_{DM}	2.5	A
Continuous Source Current (Body Diode) (Note 6)	I_S	1	A
Pulsed Source Current (Body Diode)	I_{SM}	5	A
Unclamped Single Pulse Inductive Energy, T_J = +25°C, I_D = 0.5A, V_{DD} = 24V	E_{AS}	120	mJ
Electrostatic Discharge (Human Body Model)	V_{HBM}	4,000	V
Charged Device Model	V_{CDM}	1,000	V

Recommended Operating Conditions

The ZXMS6004DN8Q is optimized for use with µC operating from 3.3V and 5V supplies.

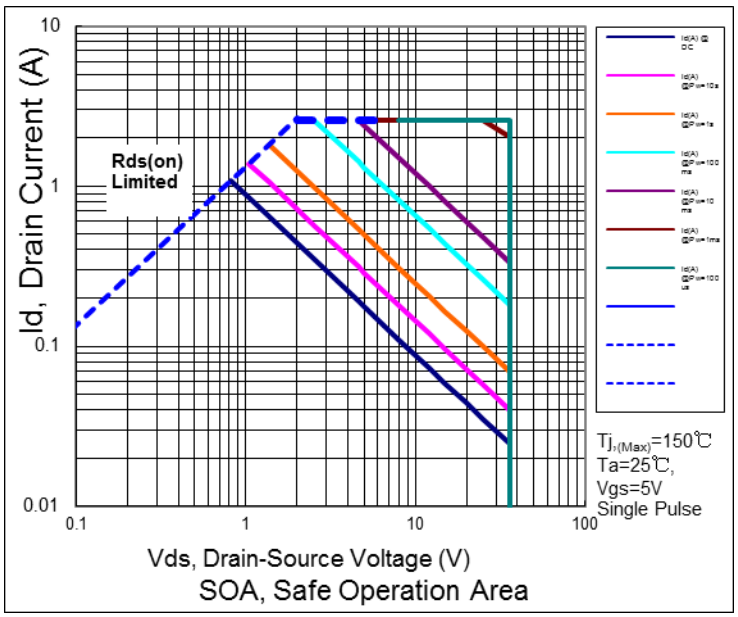
Characteristic	Symbol	Min	Max	Unit
Input Voltage Range	V_{IN}	0	5.5	V
Ambient Temperature Range	T_A	-40	+125	°C
High Level Input Voltage for MOSFET to be On	V_{IH}	3	5.5	V
Low Level Input Voltage for MOSFET to be Off	V_{IL}	0	0.7	V
Peripheral Supply Voltage (voltage to which load is referred)	V_P	0	36	V

Thermal Characteristics

Characteristic	Symbol	Value	Units
Power Dissipation at T_A = +25°C (Note 6) Linear Derating Factor	P_D	1.21 9.7	W mW/°C
Power Dissipation at T_A = +25°C (Note 7) Linear Derating Factor	P_D	1.56 12.5	W mW/°C
Thermal Resistance, Junction to Ambient (Note 6)	$R_{\theta JA}$	103	°C/W
Thermal Resistance, Junction to Ambient (Note 7)	$R_{\theta JA}$	81	°C/W
Thermal Resistance, Junction to Case (Note 8)	$R_{\theta JC}$	13.5	°C/W
Operating Temperature Range	T_J	-40 to +150	°C
Storage Temperature Range	T_{STG}	-55 to +150	°C

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

Thermal Characteristics (Continued)



SOA, Safe Operation Area

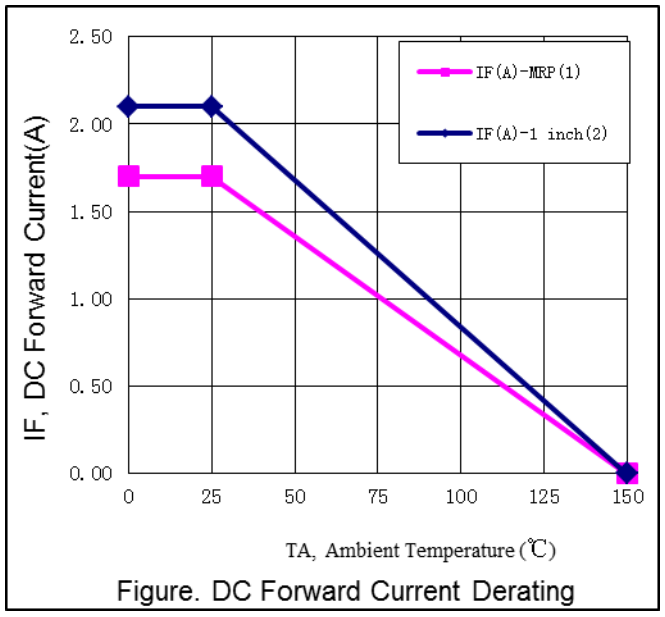


Figure. DC Forward Current Derating

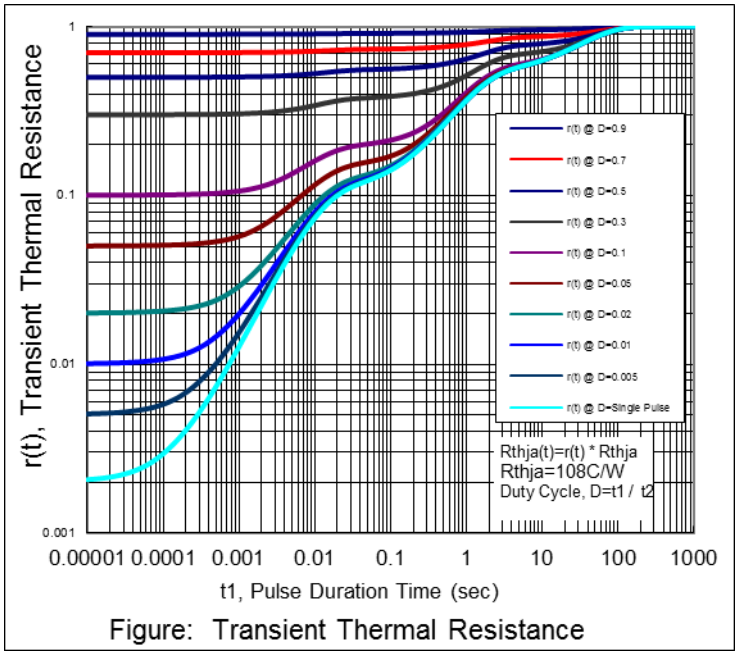


Figure: Transient Thermal Resistance

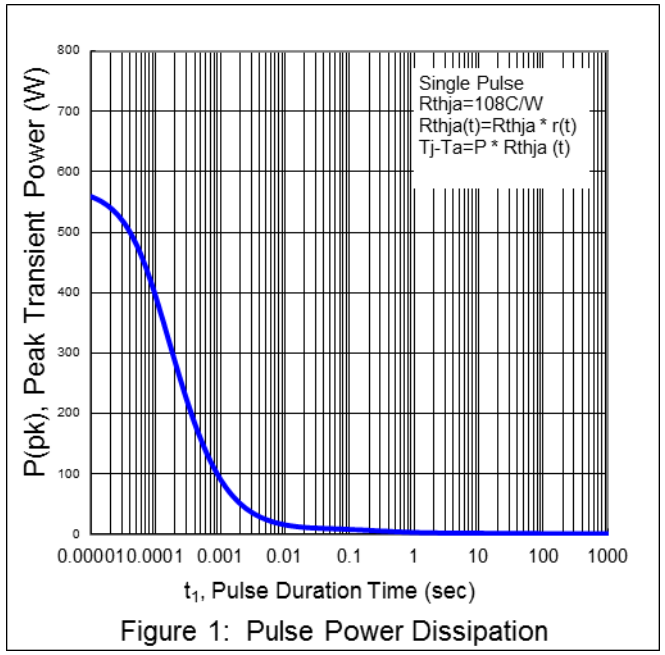


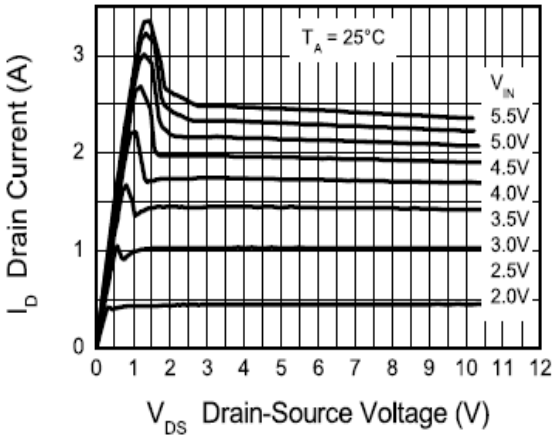
Figure 1: Pulse Power Dissipation

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

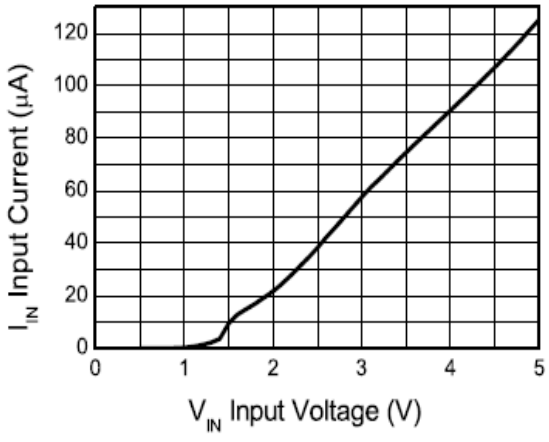
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Static Characteristics						
Drain-Source Clamp Voltage	$V_{DS(AZ)}$	60	65	70	V	I_D = 10mA
Off-State Drain Current	I_{DSS}	—	—	1	µA	V_{DS} = 12V, V_{IN} = 0V
		—	—	2		V_{DS} = 36V, V_{IN} = 0V
Input Threshold Voltage	$V_{IN(TH)}$	0.7	1	1.5	V	V_{DS} = 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	—	—	—	300	µA	V_{IN} = +5V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	—	400	600	mΩ	V_{IN} = +3V, I_D = 1A
		—	350	500		V_{IN} = +5V, I_D = 1A
Continuous Drain Current (Notes 6)	I_D	0.9	—	—	A	V_{IN} = 3V; T_A = +25°C
		1.0	—	—		V_{IN} = 5V; T_A = +25°C
Continuous Drain Current (Note 6)		1.1	—	—		V_{IN} = 3V; T_A = +25°C
		1.2	—	—		V_{IN} = 5V; T_A = +25°C
Current Limit (Note 9)	$I_{D(LIM)}$	0.7	1.7	—	A	V_{IN} = +3V
		1	2.2	—		V_{IN} = +5V
Dynamic Characteristics						
Turn-On Delay Time	$t_{D(ON)}$	—	5	—	µs	V_{DD} = 12V, I_D = 0.5A, V_{GS} = 5V
Rise Time	t_R	—	10	—	µs	
Turn-Off Delay Time	$t_{D(OFF)}$	—	45	—	µs	
Fall Time	f_F	—	15	—	µs	
Overtemperature Protection						
Thermal Overload Trip Temperature (Note 10)	T_{JT}	+150	+175	—	°C	—
Thermal Hysteresis (Note 10)	f_F	—	+10	—	°C	—

Notes:
9. 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 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.
10. 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 over-temperature for extended periods.

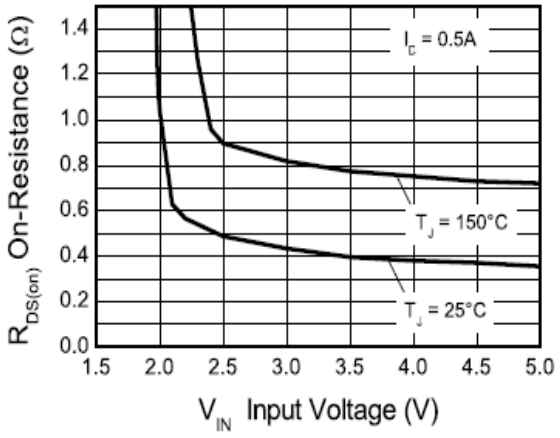
Typical Characteristics



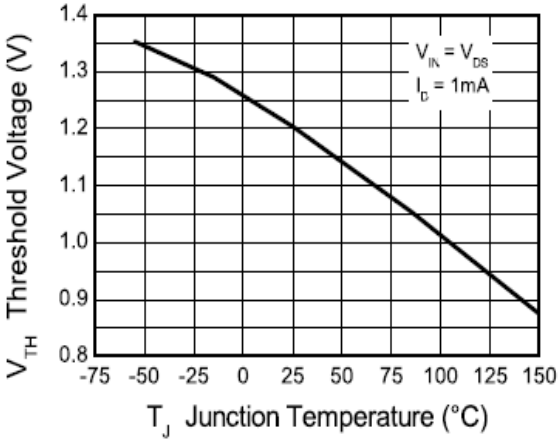
Typical Output Characteristic



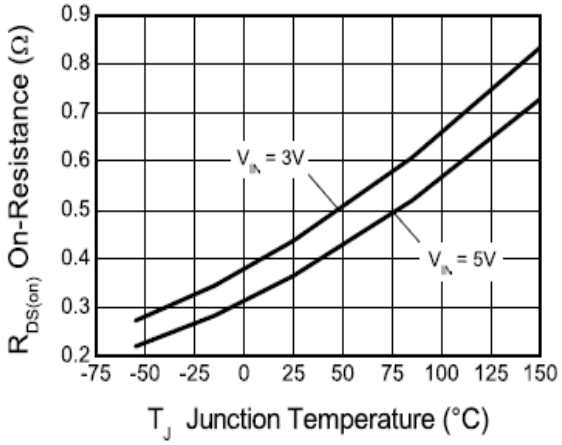
Input Current vs Input Voltage



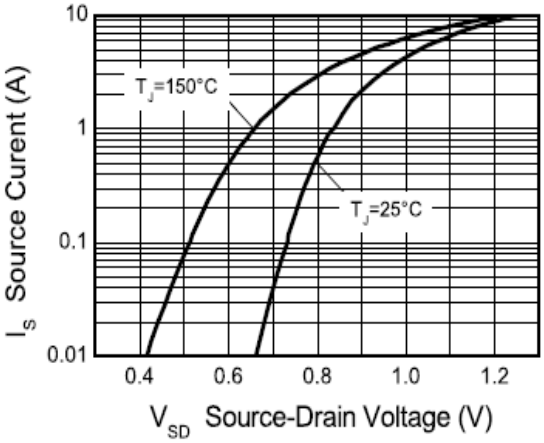
On-Resistance vs Input Voltage



Threshold Voltage vs Temperature

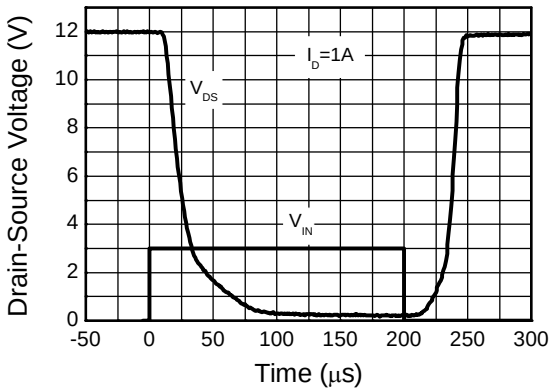


On-Resistance vs Temperature

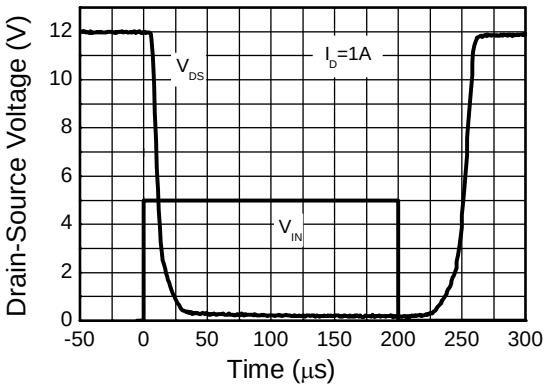


Reverse Diode Characteristic

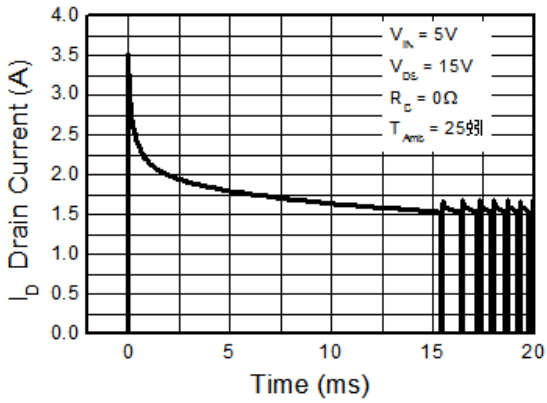
Typical Characteristics (Continued)



Switching Speed



Switching Speed

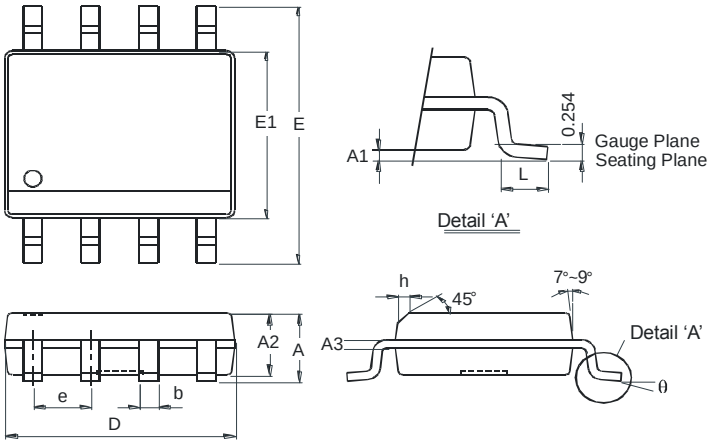


Typical Short Circuit Protection

Package Outline Dimensions

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

SO-8

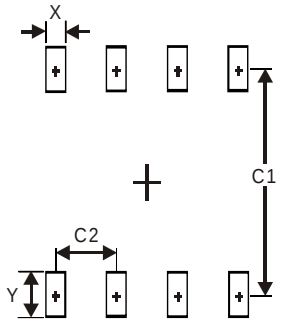


SO-8		
Dim	**Min**	**Max**
A	—	1.75
A1	0.10	0.20
A2	1.30	1.50
A3	0.15	0.25
b	0.3	0.5
D	4.85	4.95
E	5.90	6.10
E1	3.85	3.95
e	1.27 Typ	
h	—	0.35
L	0.62	0.82
θ	0°	8°
All Dimensions in mm		

Suggested Pad Layout

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

SO-8



Dimensions	Value (in mm)
X	0.60
Y	1.55
C1	5.4
C2	1.27

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