

Product Summary

- Continuous Drain Source Voltage: $V_{DS} = 60V$
- On-State Resistance: $700m\Omega$
- Nominal Load Current ($V_{IN} = 5V$): 1.1A
- Clamping Energy: 90mJ

Description

The DIODES™ ZXMS6008FFQ 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 ZXMS6008FFQ is ideal as a general purpose switch driven from 3.3V or 5V microcontrollers in harsh environments where standard MOSFETs are not rugged enough.

Applications

- Especially suited for loads with a high inrush current, such as lamps and motors
- All types of resistive, inductive and capacitive loads in switching applications
- µC compatible power switches for 12V and 24V DC applications
- Automotive rated
- 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/board combination, rather than by the protection circuitry. This does not compromise the product's ability to self-protect at low V_{DS} .



Top View

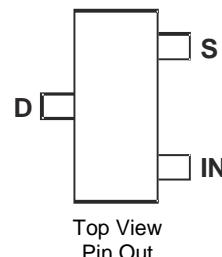
Features and Benefits

- 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 (Note 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **The ZXMS6008FFQ is suitable for automotive applications requiring specific change control; this part is AEC-Q101 qualified, PPAP capable, and manufactured in IATF 16949 certified facilities.**

<https://www.diodes.com/quality/product-definitions/>

Mechanical Data

- Package: SOT23F
- 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 (e3)
- Weight: 0.012 grams (Approximate)



Top View
Pin Out

Ordering Information (Note 4)

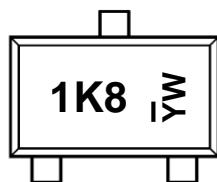
Part Number	Package	Marking	Reel Size (inches)	Tape Width (mm)	Packing	
					Qty.	Carrier
ZXMS6008FFQ-7	SOT23F	1K8	7	8	3,000	Reel

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/>.

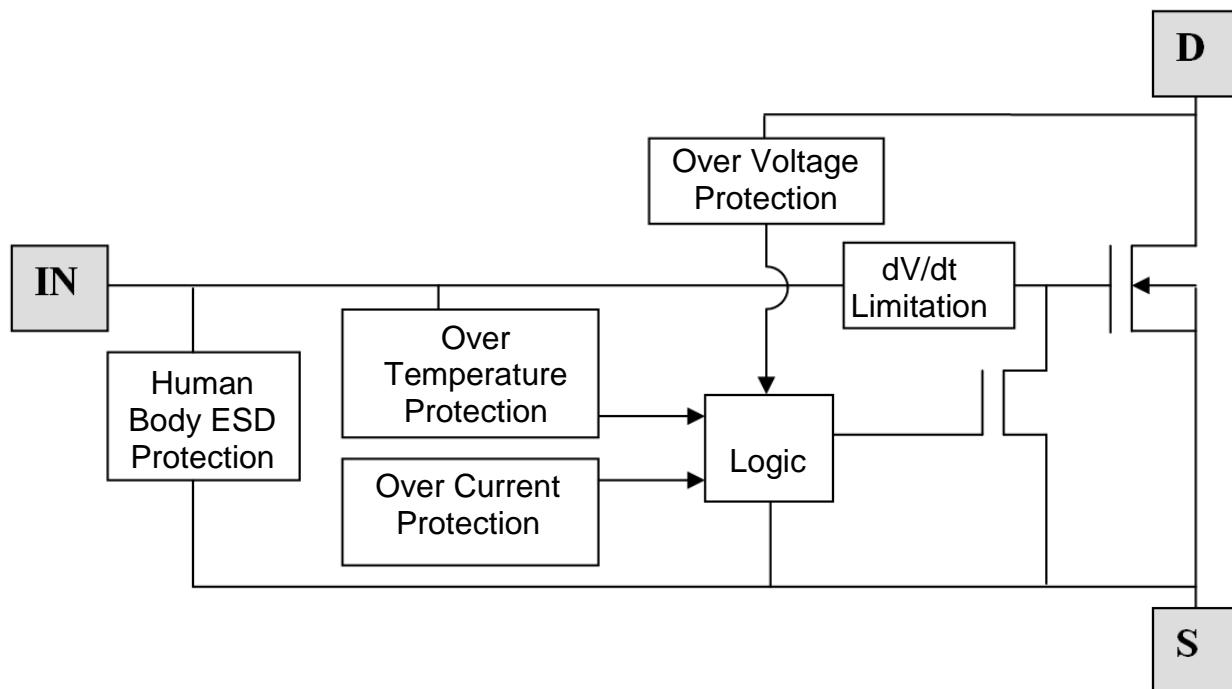
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Marking Information



1K8 = Product Type Marking Code
Y or \bar{Y} : Year: 0 to 9
W or \bar{W} : Week: A-Z: 1 to 26
a-z: 27 to 52
z: Represents 52 & 53 Week

Functional Block Diagram



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

Characteristic	Symbol	Value	Unit
Continuous Drain-Source Voltage	V_{DS}	60	V
Drain-Source Voltage for Short Circuit Protection	$V_{DS(\text{SC})}$	36	V
Continuous Input Voltage	V_{IN}	-0.5 to +6	V
Continuous Input Current @ $-0.2\text{V} \leq V_{IN} \leq 6\text{V}$	I_{IN}	No Limit	
Continuous Input Current @ $V_{IN} < -0.2\text{V}$ or $V_{IN} > 6\text{V}$		$ I_{IN} \leq 2$	mA
Pulsed Drain Current @ $V_{IN} = 3.3\text{V}$	I_{DM}	1.4	A
Pulsed Drain Current @ $V_{IN} = 5\text{V}$	I_{DM}	1.8	A
Continuous Source Current (Body Diode) (Note 5)	I_S	0.7	A
Pulsed Source Current (Body Diode)	I_{SM}	4	A
Unclamped Single Pulse Inductive Energy, $T_J = +25^\circ\text{C}$, $I_D = 0.5\text{A}$, $V_{DD} = 24\text{V}$	E_{AS}	90	mJ
Electrostatic Discharge (Human Body Model)	V_{ESD}	4000	V
Charged Device Model	V_{CDM}	1000	V

Thermal Resistance

Characteristic	Symbol	Value	Unit
Power Dissipation at $T_A = +25^\circ\text{C}$ (Note 5)	P_D	0.81	W
Linear Derating Factor		6.54	$\text{mW}/^\circ\text{C}$
Power Dissipation at $T_A = +25^\circ\text{C}$ (Note 6)	P_D	1.5	W
Linear Derating Factor		12	$\text{mW}/^\circ\text{C}$
Thermal Resistance, Junction to Ambient (Note 5)	$R_{\theta JA}$	153	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction to Ambient (Note 6)	$R_{\theta JA}$	83	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction to Lead (Note 7)	$R_{\theta JC}$	65	$^\circ\text{C}/\text{W}$
Operating Temperature Range	T_J	-40 to +150	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	-55 to +150	$^\circ\text{C}$

Notes:

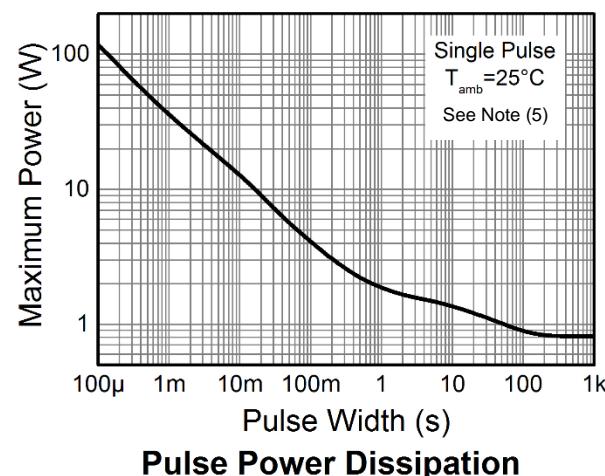
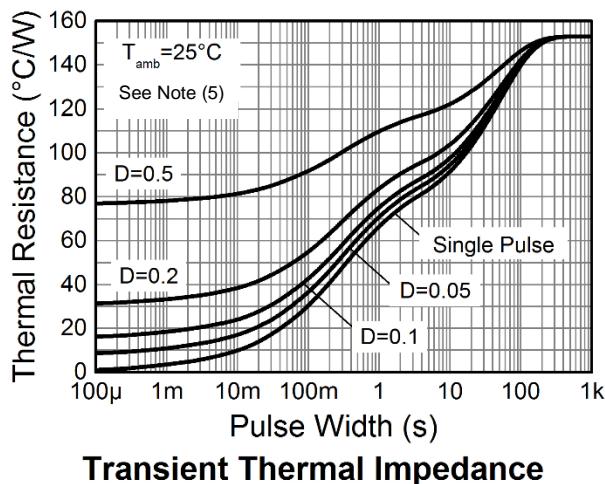
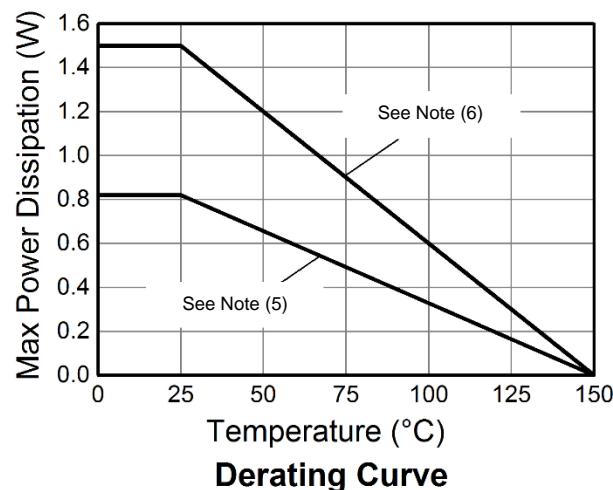
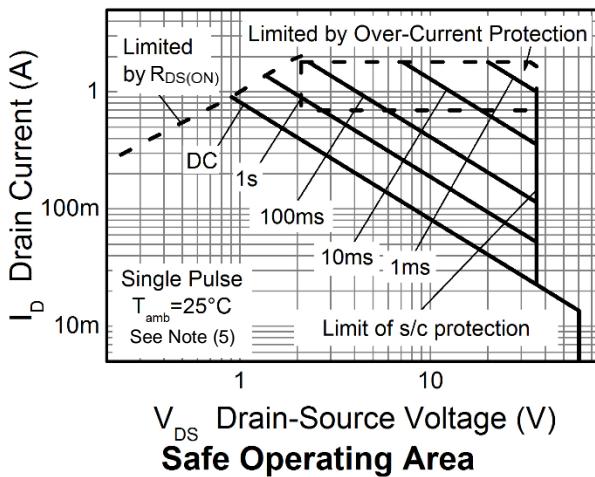
5. For a device surface mounted on 15mm x 15mm single sided 1oz weight copper on 1.6mm FR-4 board, in still air conditions.
6. For a device surface mounted on 50mm x 50mm single sided 2oz weight copper on 1.6mm FR-4 board, in still air conditions.
7. Thermal resistance between junction and the mounting surfaces of drain and source pins.

Recommended Operating Conditions

The ZXMS6008FFQ 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	36	V

Thermal Characteristics



Notes:

5. For a device surface mounted on 15mm x 15mm single sided 1oz weight copper on 1.6mm FR-4 board, in still air conditions.
6. For a device surface mounted on 50mm x 50mm single sided 2oz weight copper on 1.6mm FR-4 board, in still air conditions.

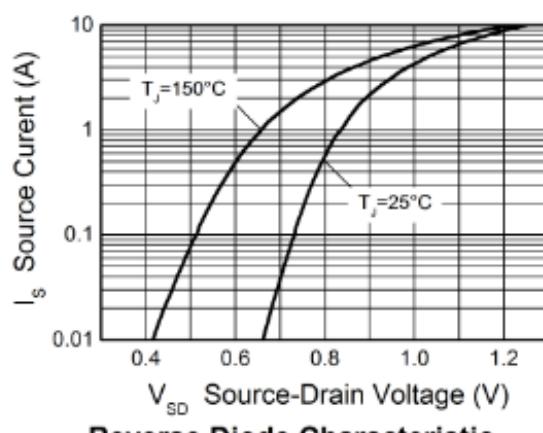
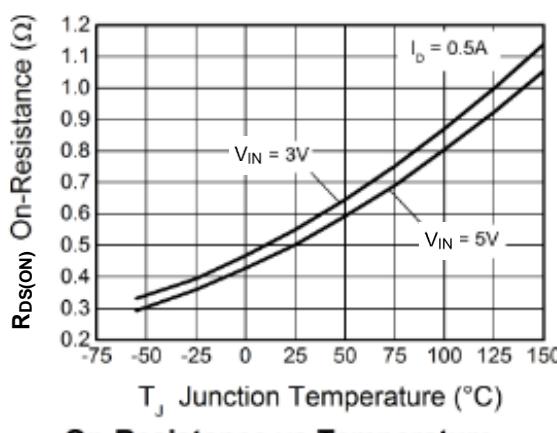
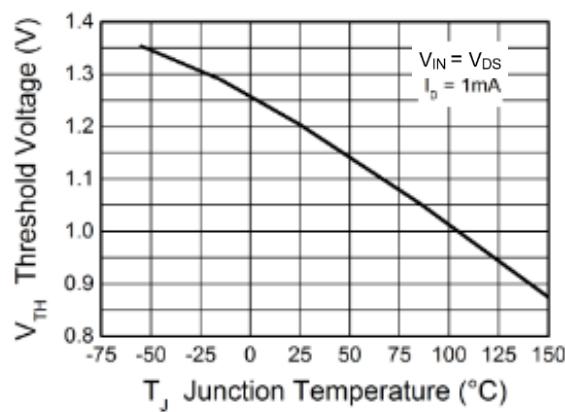
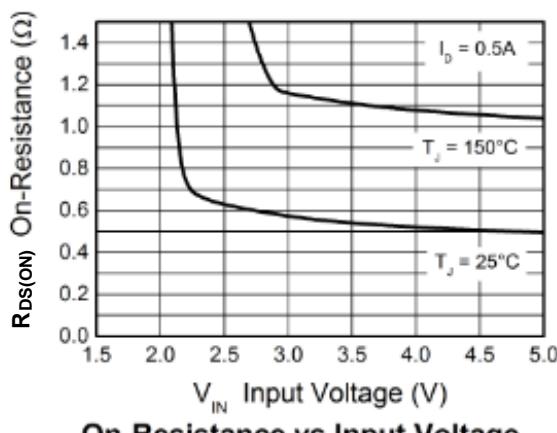
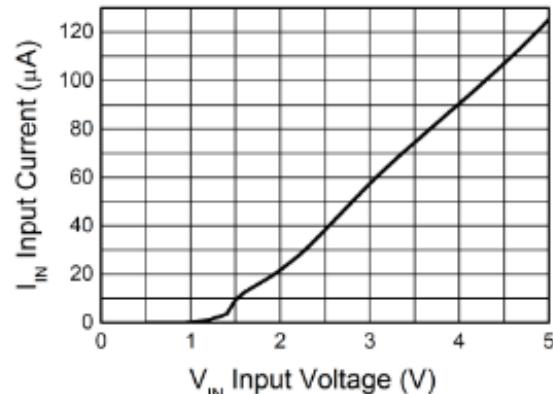
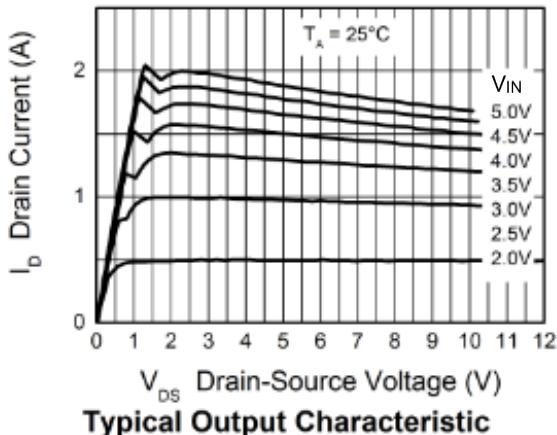
Electrical Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise stated.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Static Characteristics						
Drain-Source Clamp Voltage	$V_{DS(AZ)}$	60	65	70	V	$I_D = 10\text{mA}$
Off State Drain Current	I_{DS}	—	—	0.5	μA	$V_{DS} = 12\text{V}, V_{IN} = 0\text{V}$
		—	—	1		$V_{DS} = 36\text{V}, V_{IN} = 0\text{V}$
Input Threshold Voltage	$V_{IN(TH)}$	0.7	1.2	1.5	V	$V_{DS} = V_{GS}, I_D = 1\text{mA}$
Input Current	I_{IN}	—	60	100	μA	$V_{IN} = 3\text{V}$
		—	120	200		$V_{IN} = 5\text{V}$
Input Current While Over Temperature Active	—	—	—	350	μA	$V_{IN} = 5\text{V}$
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	—	550	800	$\text{m}\Omega$	$V_{IN} = 3\text{V}, I_D = 0.5\text{A}$
		—	500	700		$V_{IN} = 5\text{V}, I_D = 0.5\text{A}$
Continuous Drain Current (Note 5)	I_D	0.6	—	—	A	$V_{IN} = 3\text{V}, T_A = +25^\circ\text{C}$
		0.7	—	—		$V_{IN} = 5\text{V}, T_A = +25^\circ\text{C}$
		0.8	—	—		$V_{IN} = 3\text{V}, T_A = +25^\circ\text{C}$
		0.9	—	—		$V_{IN} = 5\text{V}, T_A = +25^\circ\text{C}$
Current Limit (Note 8)	$I_{D(LIM)}$	0.5	1.2	—	A	$V_{IN} = 3\text{V}$
		0.7	1.6	—		$V_{IN} = 5\text{V}$
Dynamic Characteristics						
Turn-On Delay Time	$t_{D(ON)}$	—	5	—	μs	$V_{DD} = 12\text{V}, I_D = 0.5\text{A}, V_{GS} = 5\text{V}$
Rise Time	t_R	—	10	—		
Turn-Off Delay Time	$t_{D(OFF)}$	—	45	—		
Fall Time	t_F	—	15	—		
Overtemperature Protection						
Thermal Overload Trip Temperature (Note 9)	T_{JT}	+150	+175	—	$^\circ\text{C}$	—
Thermal Hysteresis (Note 9)	—	—	+10	—	$^\circ\text{C}$	—

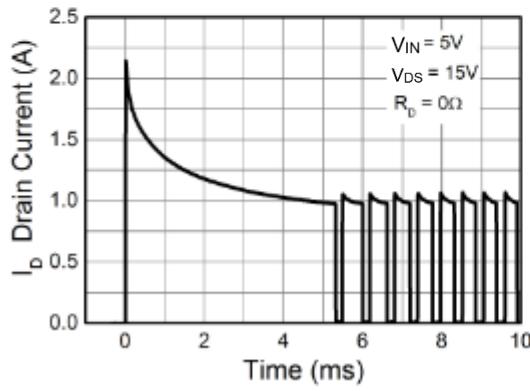
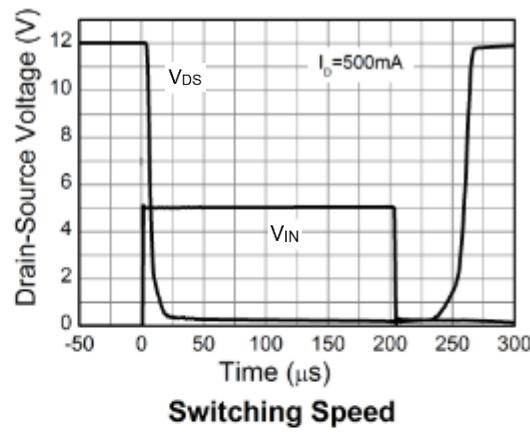
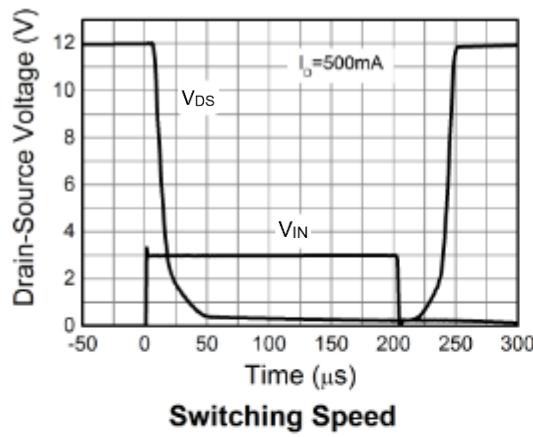
Notes:

5. For a device surface mounted on 15mm x 15mm single sided 1oz weight copper on 1.6mm FR-4 board, in still air conditions.
6. For a device surface mounted on 50mm x 50mm single sided 2oz weight copper on 1.6mm FR-4 board, in still air conditions.
8. 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.
9. 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 Characteristics (continued)

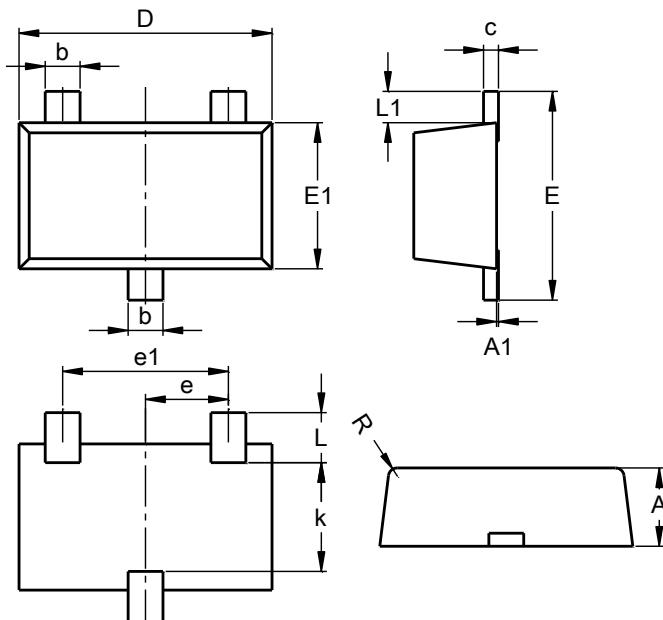


Typical Short Circuit Protection

Package Outline Dimensions

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

SOT23F

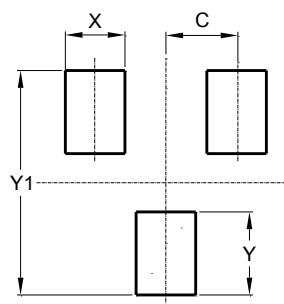


SOT23F			
Dim	Min	Max	Typ
A	0.80	1.00	0.90
A1	0.00	0.10	0.01
b	0.35	0.50	0.44
c	0.10	0.20	0.16
D	2.80	3.00	2.90
e	0.95 REF		
e1	1.90 REF		
E	2.30	2.50	2.40
E1	1.50	1.70	1.65
k	1.20	-	-
L	0.30	0.65	0.50
L1	0.30	0.50	0.40
R	0.05	0.15	-
All Dimensions in mm			

Suggested Pad Layout

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

SOT23F



Dimensions	Value (in mm)
C	0.95
X	0.80
Y	1.110
Y1	3.000

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