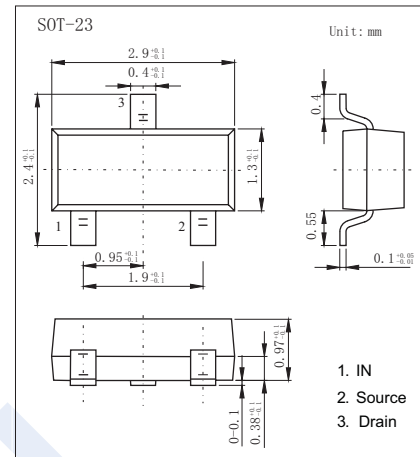


N-Channel Self Protected Enhancement Mode MOSFET ZXMS6004FF(KXMS6004FF)

■ Features

- Compact high power dissipation package
- Low input current
- Logic Level Input (3.3V and 5V)
- Short circuit protection with auto restart
- Over voltage protection (active clamp)
- Thermal shutdown with auto restart
- Over-current protection
- Input Protection (ESD)
- High continuous current rating



■ Absolute Maximum Ratings $T_a = 25^\circ\text{C}$

Parameter	Symbol	Rating	Unit
Drain-Source Voltage	V_{DS}	60	V
Drain-Source voltage for short circuit protection	$V_{DS(sc)}$	36	
Continuous input Voltage	V_{IN}	-0.5 ... +6	
Continuous input Current $-0.2V \leq V_{IN} \leq 6V$ $V_{IN} < -0.2V$ or $V_{IN} > 6V$	I_{IN}	No limit $ I_{IN} \leq 2$	mA
Pulsed Drain Current @ $V_{IN}=3.3V$ Pulsed Drain Current @ $V_{IN}=5V$	I_{DM}	2 2.5	A
Power Dissipation at $T_A = 25^\circ\text{C}$ ^(a) Linear derating factor	P_D	0.83 6.66	W mW/°C
Power Dissipation at $T_A = 25^\circ\text{C}$ ^(b) Linear derating factor	P_D	1.5 12	W mW/°C
Continuous source current (Body Diode) ^(a)	I_S	1	A
Pulsed source current (Body Diode)	I_{SM}	5	
Unclamped single pulse inductive energy, $T_J=25^\circ\text{C}$, $I_D=0.5A$, $V_{DD}=24V$	E_{AS}	90	mJ
Electrostatic discharge (Human body model)	V_{ESD}	4000	V
Charged device model	V_{CDM}	1000	
Thermal Resistance.Junction- to-Ambient ^(a)	R_{thJA}	150	°C/W
Thermal Resistance.Junction- to-Ambient ^(b)	R_{thJA}	83	
Thermal Resistance.Junction- to-Case ^(c)	R_{thJC}	44	
Junction Temperature	T_J	150	°C
Storage Temperature Range	T_{stg}	-55 to 150	

Note:

- (a) For a device surface mounted on a 15mm x 15mm single sided 1oz weight copper on 1.6mm FR4 board, in still air conditions.
 (b) For a device surface mounted on 50mm x 50mm single sided 2oz weight copper on 1.6mm FR4 board, in still air conditions.
 (c) Thermal resistance from junction to the mounting surface of the drain pin.

N-Channel Self Protected Enhancement Mode MOSFET ZXMS6004FF(KXMS6004FF)

■ Electrical Characteristics Ta = 25°C

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Static Characteristics						
Drain-Source Clamp Voltage	V _{DS(AZ)}	I _D =10 mA, V _{GS} =0V	60		70	V
Off-state drain Current	I _{DSS}	V _{DS} =12V, V _{IN} =0V			500	nA
		V _{DS} =36V, V _{IN} =0V			1	μA
Input threshold voltage	V _{IN(th)}	V _{DS} =V _{GS} , I _D =1mA	0.7		1.5	V
Input Current	I _{IN}	V _{IN} =+3V			100	μA
Input Current	I _{IN}	V _{IN} =+5V			200	
Input current while over temperature active		V _{IN} =+5V			220	
Static Drain-Source On-Resistance	R _{DS(on)}	V _{IN} =+3V, I _D =0.5A			600	mΩ
		V _{IN} =+5V, I _D =0.5A			500	
Continuous drain current ^(a)	I _D	V _{IN} =3V, T _A =25°C	0.9			A
Continuous drain current ^(a)	I _D	V _{IN} =5V, T _A =25°C	1			A
Continuous drain current ^(b)	I _D	V _{IN} =3V, T _A =25°C	1.2			A
Continuous drain current ^(b)	I _D	V _{IN} =5V, T _A =25°C	1.3			A
Current limit	I _{D(LIM)}	V _{IN} =+3V	0.7			A
Current limit ^(d)	I _{D(LIM)}	V _{IN} =+5V	1			A
Dynamic characteristics						
Turn-On DelayTime	t _{d(on)}	V _{GS} =5V, V _{DS} =12V, I _D =0.5A		5		μs
Rise Time	t _r			10		
Turn-Off DelayTime	t _{d(off)}			45		
Fall Time	t _f			15		
Over-temperature protection						
Thermal overload trip temperature ^(e)	T _{JT}		150	175		°C
Thermal hysteresis ^(e)				10		°C

Notes:

(d) 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.

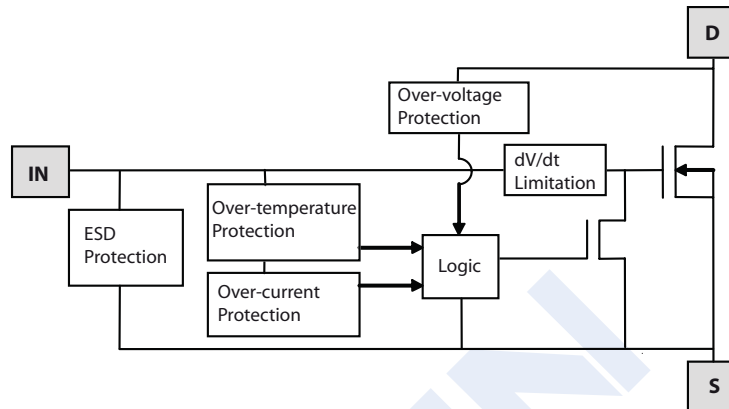
(e) Over-temperature protection is designed to prevent device destruction under fault conditions. Fault conditions are considered as "outside" normal operating range, so this part is not designed to withstand over-temperature for extended periods.

■ Marking

Marking	1K6
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N-Channel Self Protected Enhancement Mode MOSFET ZXMS6004FF(KXMS6004FF)

■ Functional block diagram



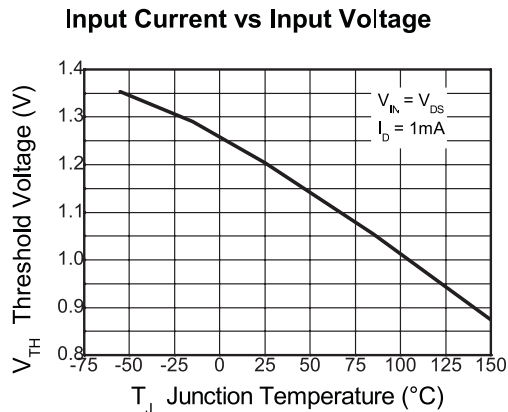
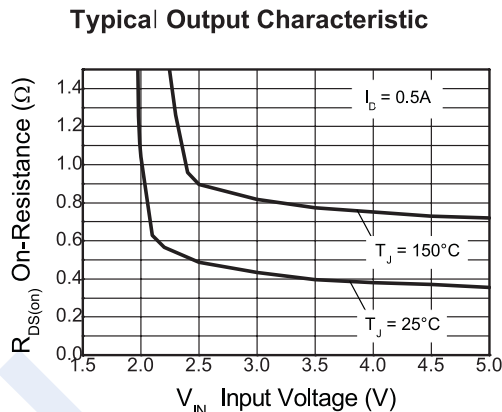
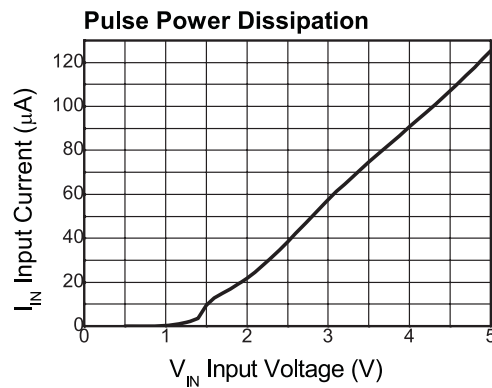
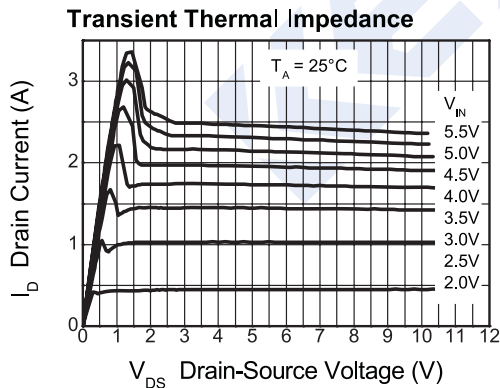
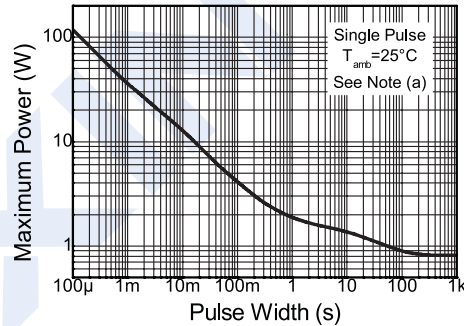
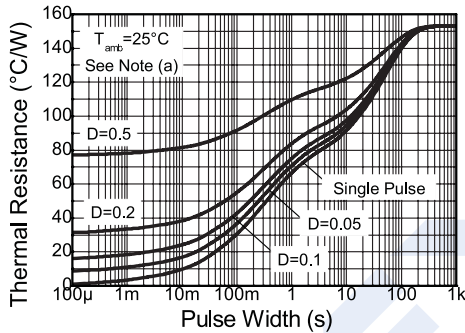
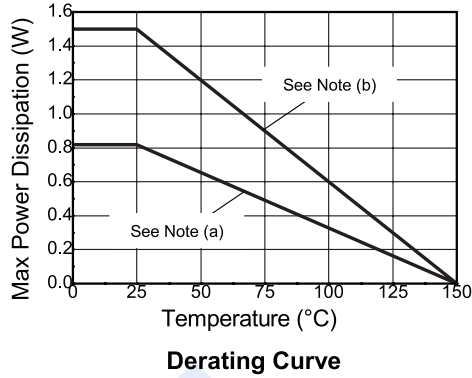
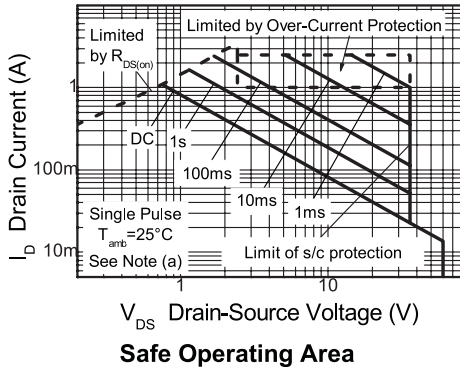
■ Recommended operating conditions

The ZXMS6004FF is optimised for use with μC operating from 3.3V and 5V supplies.

Symbol	Description	Min	Max	Units
V_{IN}	Input voltage range	0	5.5	V
T_{A}	Ambient temperature range	-40	125	$^{\circ}\text{C}$
V_{IH}	High level input voltage for MOSFET to be on	3	5.5	V
V_{IL}	Low level input voltage for MOSFET to be off	0	0.7	V
V_{P}	Peripheral supply voltage (voltage to which load is referred)	0	36	V

N-Channel Self Protected Enhancement Mode MOSFET FZXMS6004FF(KXMS6004FF)

■ Typical Characteristics

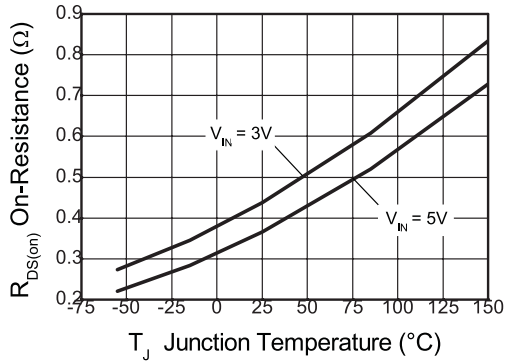


On-Resistance vs Input Voltage

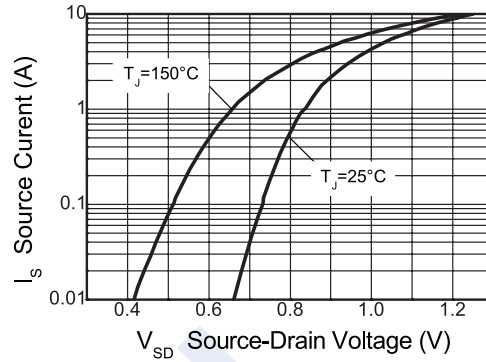
Threshold Voltage vs Temperature

N-Channel Self Protected Enhancement Mode MOSFET ZXMS6004FF(KXMS6004FF)

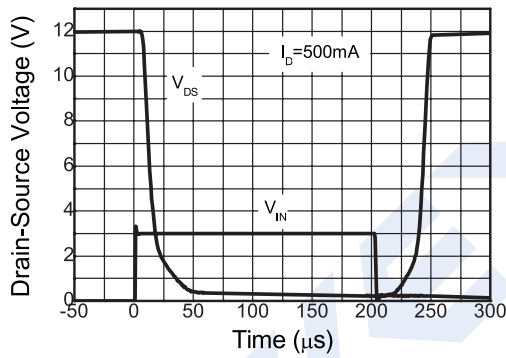
■ Typical Characteristics



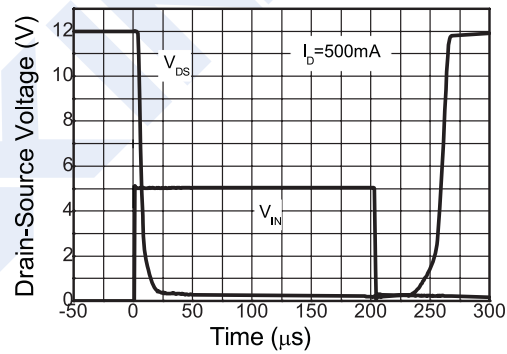
On-Resistance vs Temperature



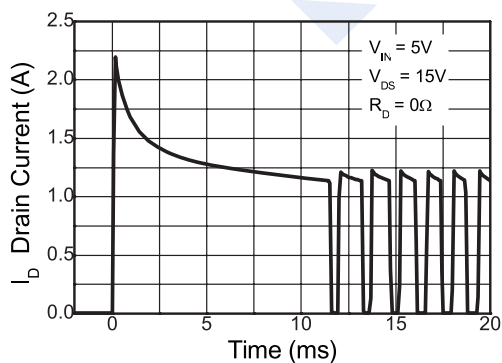
Reverse Diode Characteristic



Switching Speed



Switching Speed



Typical Short Circuit Protection