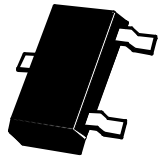
20V N-CHANNEL ENHANCEMENT MODE MOSFET

SUMMARY

$V_{(BR)DSS}$=20V; $R_{DS(ON)}$=0.18Ω; I_D=1.7A



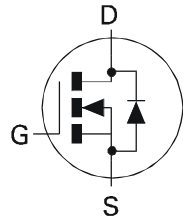
SOT23

DESCRIPTION

This new generation of high density MOSFETs from Zetex utilises a unique structure that combines the benefits of low on-resistance with fast switching speed. This makes them ideal for high efficiency, low voltage, power management applications.

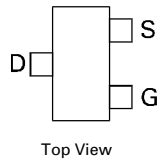
FEATURES

- Low on-resistance
- Fast switching speed
- Low threshold
- Low gate drive
- SOT23 package



APPLICATIONS

- DC - DC Converters
- Power Management Functions
- Disconnect switches
- Motor control



Top View

ORDERING INFORMATION

DEVICE	REEL SIZE (inches)	TAPE WIDTH (mm)	QUANTITY PER REEL
ZXM61N02FTA	7	8mm embossed	3000 units
ZXM61N02FTC	13	8mm embossed	10000 units

DEVICE MARKING

- N02

ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	V_{DSS}	20	V
Gate Source Voltage	V_{GS}	± 12	V
Continuous Drain Current (V_{GS}=4.5V; T_A=25°C)(b) (V_{GS}=4.5V; T_A=70°C)(b)	I_D	1.7 1.3	A
Pulsed Drain Current (c)	I_{DM}	7.4	A
Continuous Source Current (Body Diode) (b)	I_S	0.8	A
Pulsed Source Current (Body Diode)	I_{SM}	7.4	A
Power Dissipation at T_A=25°C (a) Linear Derating Factor	P_D	625 5	mW mW/°C
Power Dissipation at T_A=25°C (b) Linear Derating Factor	P_D	806 6.4	mW mW/°C
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150	°C

THERMAL RESISTANCE

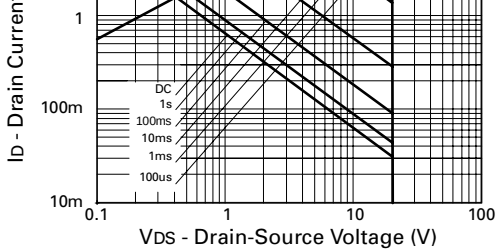
PARAMETER	SYMBOL	VALUE	UNIT
Junction to Ambient (a)	$R_{\theta JA}$	200	°C/W
Junction to Ambient (b)	$R_{\theta JA}$	155	°C/W

NOTES

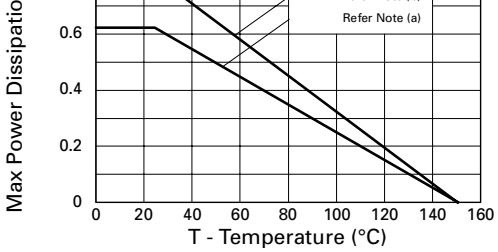
(a) For a device surface mounted on 25mm x 25mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions

(b) For a device surface mounted on FR4 PCB measured at t≤5 secs.

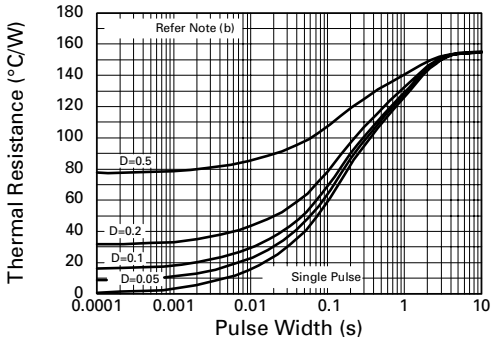
(c) Repetitive rating - pulse width limited by maximum junction temperature. Refer to Transient Thermal Impedance graph.



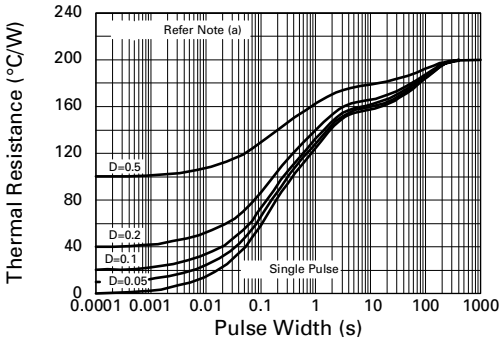
Safe Operating Area



Derating Curve



Transient Thermal Impedance



Transient Thermal Impedance

ELECTRICAL CHARACTERISTICS (at T_A = 25°C unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.(3)	MAX.	UNIT	CONDITIONS.
STATIC						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	20			V	I_D=250μA, V_{GS}=0V
Zero Gate Voltage Drain Current	I_{DSS}			1	μA	V_{DS}=20V, V_{GS}=0V
Gate-Body Leakage	I_{GSS}			100	nA	V_{GS}=± 12V, V_{DS}=0V
Gate-Source Threshold Voltage	$V_{GS(th)}$	0.7			V	I_D=250μA, V_{DS}= V_{GS}
Static Drain-Source On-State Resistance (1)	$R_{DS(on)}$			0.18 0.24	Ω Ω	V_{GS}=4.5V, I_D=0.93A V_{GS}=2.7V, I_D=0.47A
Forward Transconductance (3)	g_{fs}	1.3			S	V_{DS}=10V,I_D=0.47A
DYNAMIC (3)						
Input Capacitance	C_{iss}		160		pF	V_{DS}=15 V, V_{GS}=0V, f=1MHz
Output Capacitance	C_{oss}		50		pF	
Reverse Transfer Capacitance	C_{rss}		30		pF	
SWITCHING(2) (3)						
Turn-On Delay Time	$t_{d(on)}$		2.4		ns	V_{DD}=10V, I_D=0.93A R_G=6.2Ω, R_D=11Ω (refer to test circuit)
Rise Time	t_r		4.2		ns	
Turn-Off Delay Time	$t_{d(off)}$		7.8		ns	
Fall Time	t_f		4.2		ns	
Total Gate Charge	Q_g			3.4	nC	V_{DS}=16V,V_{GS}=4.5V, I_D=0.93A (refer to test circuit)
Gate-Source Charge	Q_{gs}			0.41	nC	
Gate-Drain Charge	Q_{gd}			0.8	nC	
SOURCE-DRAIN DIODE						
Diode Forward Voltage (1)	V_{SD}			0.95	V	T_J=25°C, I_S=0.93A, V_{GS}=0V
Reverse Recovery Time (3)	t_{rr}		12.9		ns	T_J=25°C, I_F=0.93A, di/dt= 100A/μs
Reverse Recovery Charge (3)	Q_{rr}		5.2		nC	

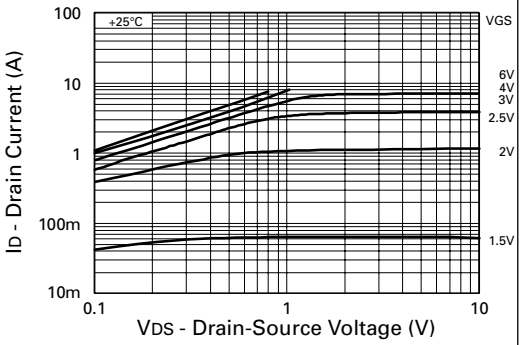
NOTES

(1) Measured under pulsed conditions. Width≤300μs. Duty cycle ≤2% .

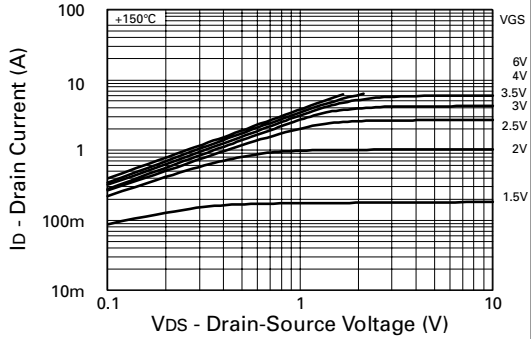
(2) Switching characteristics are independent of operating junction temperature.

(3) For design aid only, not subject to production testing.

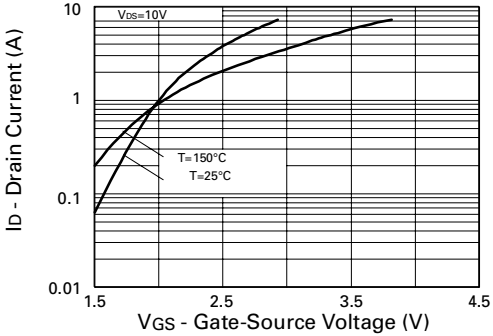
TYPICAL CHARACTERISTICS



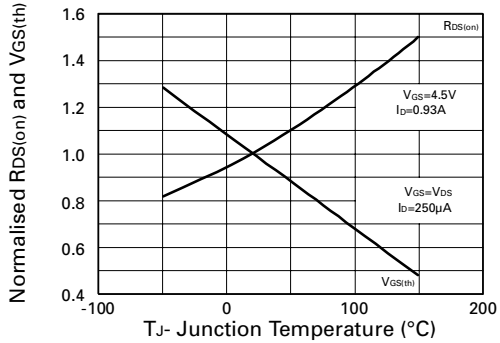
Output Characteristics



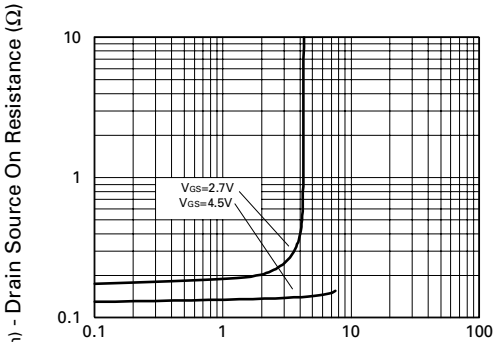
Output Characteristics



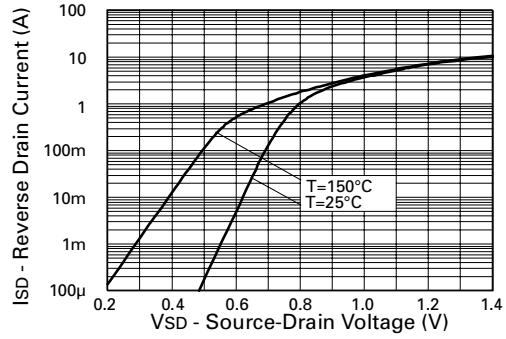
Transfer Characteristics



Normalised RDS(on) and VGS(th) v Temperature

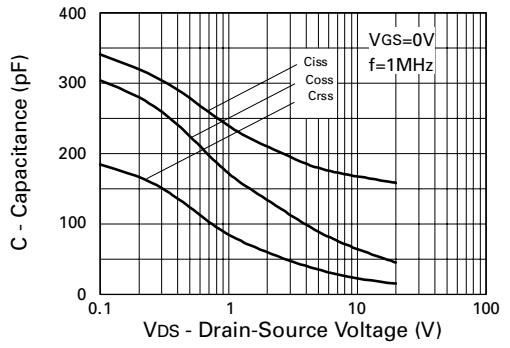


On-Resistance v Drain Current

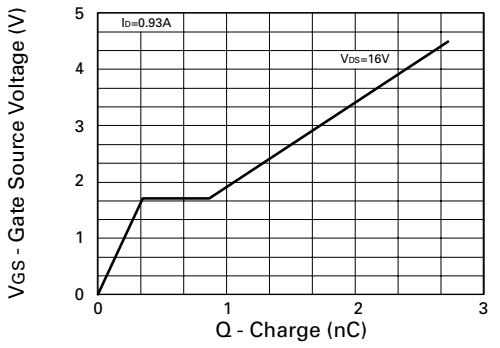


Source-Drain Diode Forward Voltage

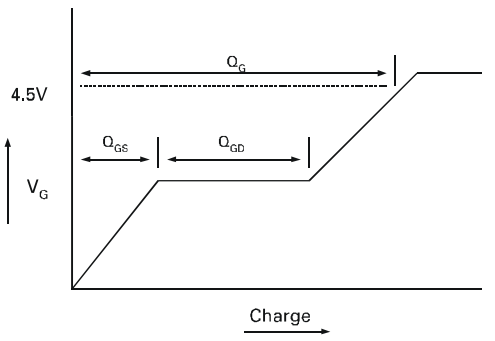
TYPICAL CHARACTERISTICS



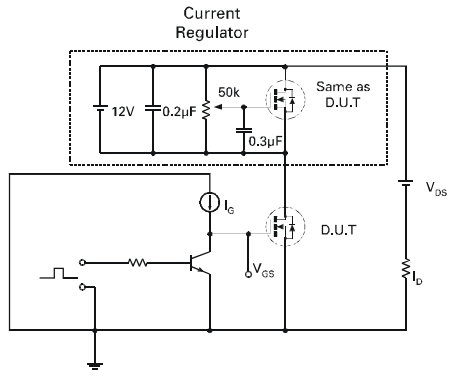
Capacitance v Drain-Source Voltage



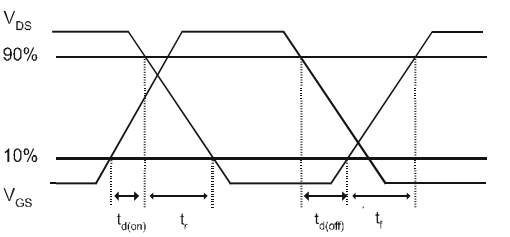
Gate-Source Voltage v Gate Charge



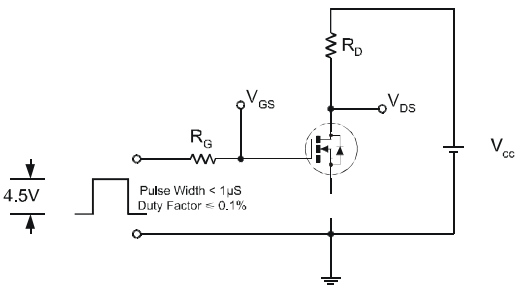
Basic Gate Charge Waveform



Gate Charge Test Circuit

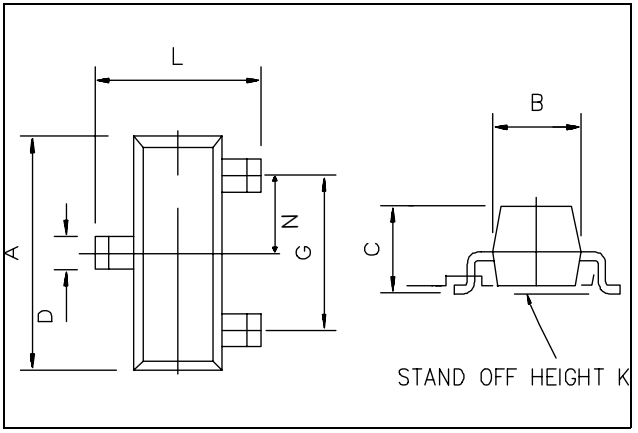


Switching Time Waveforms



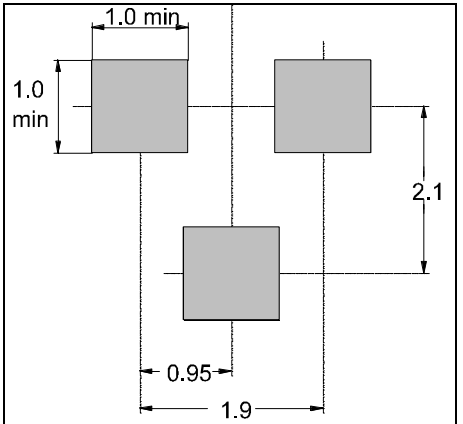
Switching Time Test Circuit

PACKAGE DIMENSIONS



DIM	Millimetres		Inches	
	Min	Max	Min	Max
A	2.67	3.05	0.105	0.120
B	1.20	1.40	0.047	0.055
C	–	1.10	–	0.043
D	0.37	0.53	0.0145	0.021
F	0.085	0.15	0.0033	0.0059
G	NOM 1.9		NOM 0.075	
K	0.01	0.10	0.0004	0.004
L	2.10	2.50	0.0825	0.0985
N	NOM 0.95		NOM 0.037	

PAD LAYOUT DETAILS



SOT23 pattern.
Minimum Pad Size (dimensions in mm)

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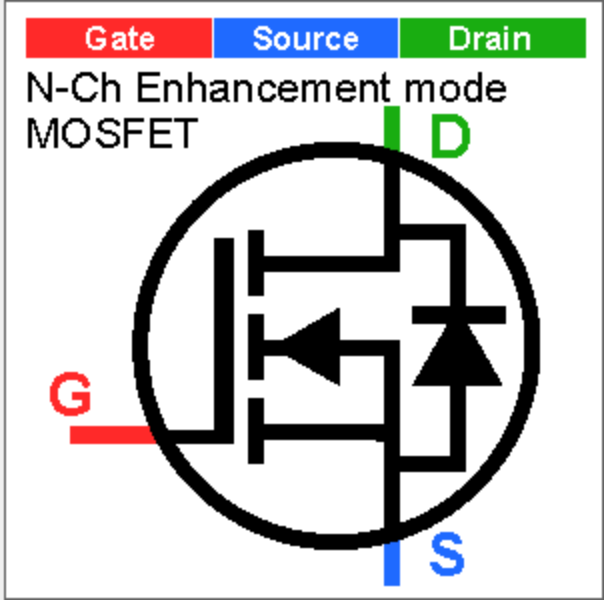
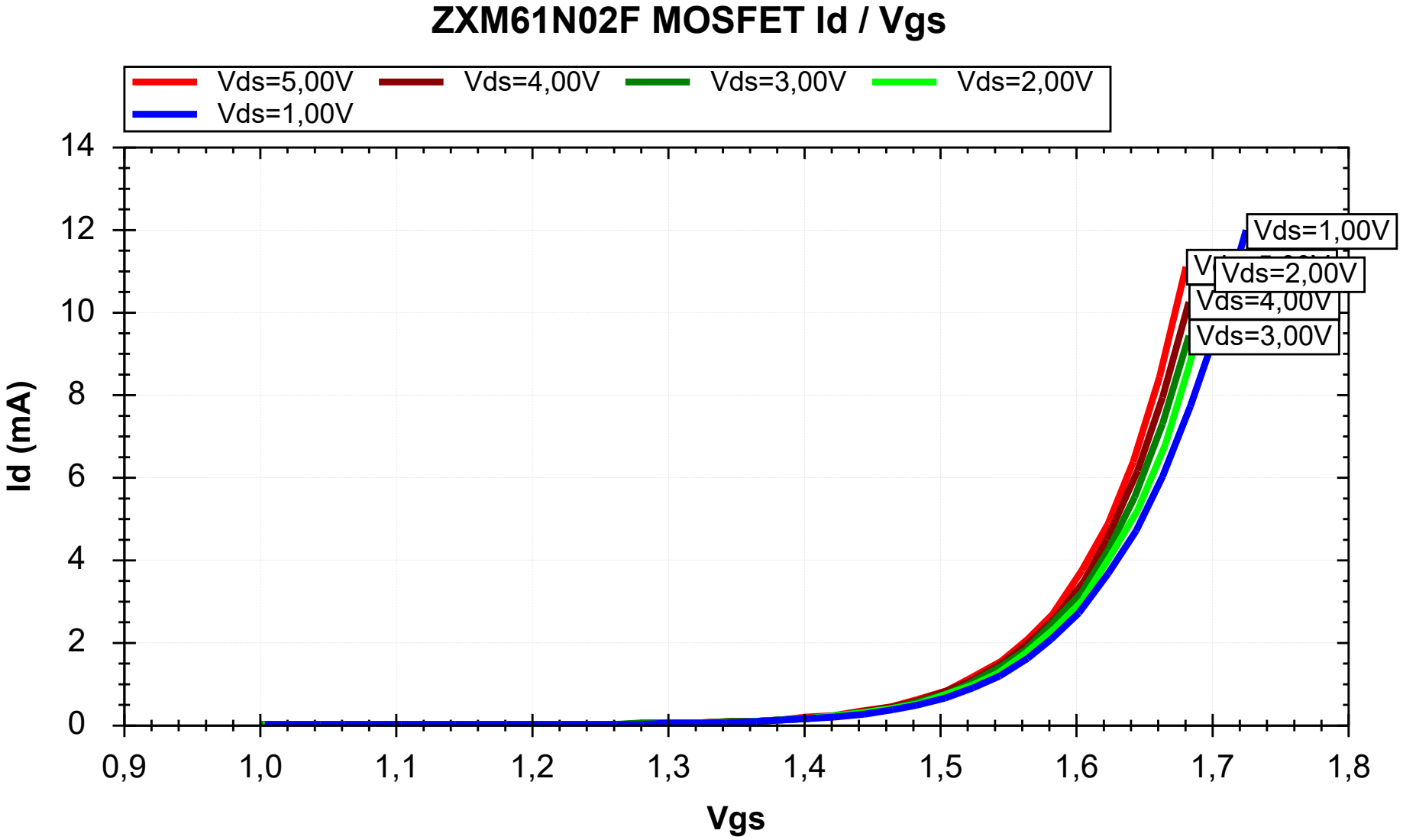
Fax: (852) 24250 494

These are supported by
agents and distributors in
major countries world-wide

Internet:http://www.zetex.com

N-Ch Enhancement mode MOSFET
Red-G Green-D Blue-S
Vgs(on)=1,637V at Id=5,02mA and Ig=0µA
Vgs(off)=1,159V at Id=5,2µA
gm=55,7mA/V at Id=3,0mA to 5,0mA
Rds(on)<1.0Ω at Id=5,0mA and Vgs=8,0V
with body diode




ZXM61N02F MOSFET Id / Vgs
Vds=5,00V
Vds=4,00V
Vds=3,00V
Vds=2,00V
Vds=1,00V
Id (mA)
Vgs
0
2
4
6
8
10
12
14
0,9
1,0
1,1
1,2
1,3
1,4
1,5
1,6
1,7
1,8
Vds=1,00V
Vds=2,00V
Vds=4,00V
Vds=3,00V

SPICE MODEL FÜR ZXM61N02F

```
[ZXM61N02F]
*ZETEX ZXM61N02F Spice Model v1.0 Last Revised 24/2/04
    *
    .SUBCKT ZXM61N02F 3 4 5
    *----connections----D-G-S
    *
    M1 6 20 8 8 MOSMOD
    M2 6 20 8 8 MOSMODS
    RG 4 2 6
    RIN 2 8 200E6
    RD 3 6 RMOD1 0.03
    RS 8 5 RMOD1 0.0225
    RL 3 5 35E6
    C1 2 8 158E-12
    C3 15 14 175E-12
    C4 16 8 183E-12
    D1 5 3 DMOD1
    D2 17 3 DMOD2
    S1 2 15 14 13 SMOD1a
    S2 13 15 14 13 SMOD1b
    S3 16 13 13 8 SMOD2a
    S4 16 2 13 8 SMOD2b
    Egs1 2 17 2 8 1
    Egs2 13 8 2 8 1
    Eds1 14 8 3 8 1
    Egt1 2 20 21 8 -1
    Vgt1 8 22 1
    Igt1 8 21 1
    Rgt 21 22 RMOD2 1
    .MODEL MOSMOD NMOS VTO=1.35 IS=1E-15 KP=5.5 CBD=90E-12 LAMBDA=4.9E-3
    .MODEL MOSMODS NMOS VTO=0.95 IS=1E-15 KP=0.055
    .MODEL DMOD1 D IS=1E-13 RS=0.15 BV=24 IBV=1E-6 TT=9e-9
    .MODEL DMOD2 D CJO=190e-12 IS=1e-30 N=10
    .MODEL SMOD1a VSWITCH RON=1e-2 ROFF=1e4  VON=-1.75 VOFF=2.75
    .MODEL SMOD1b VSWITCH RON=1e-2 ROFF=1e4  VON=2.75 VOFF=-1.75
    .MODEL SMOD2a VSWITCH RON=1e2 ROFF=1e4  VON=-1.5 VOFF=-3.5
    .MODEL SMOD2b VSWITCH RON=1e-2 ROFF=1e4  VON=-3.5 VOFF=-1.5
    .MODEL RMOD1 RES (TC1=2.5E-3 TC2=1.8E-5)
    .MODEL RMOD2 RES (TC1=3.3E-3 TC2=1.5E-6)
    .ENDS  ZXM61N02F
    *
    *$
    *
```