



YOUSHANG SEMICONDUCTOR

**设计研发新型功率器件**

**各类小信号开关**

**中低压及高压大电流等场效应管**

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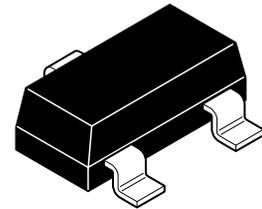
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### Summary

$V_{(BR)DSS}$	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
20	0.100 @ $V_{GS} = 4.5V$	2.4
	0.150 @ $V_{GS} = 2.5V$	2.0
	0.200 @ $V_{GS} = 1.8V$	1.7



### Description

This new generation trench MOSFET from Zetex features low on-resistance achievable with low gate drive.

### Features

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

### Applications

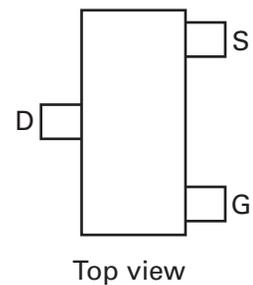
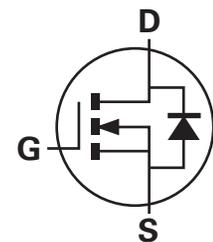
- DC-DC converters
- Power management functions
- Disconnect switches
- Motor control

### Ordering information

Device	Reel size (inches)	Tape width (mm)	Quantity per reel
NK-ZXMN2B01FTA	7	8	3,000

### Device marking

2B1



### Absolute maximum ratings

Parameter	Symbol	Limit	Unit
Drain-source voltage	$V_{DSS}$	20	V
Gate-source voltage	$V_{GS}$	$\pm 8$	V
Continuous drain current	$I_D$	@ $V_{GS} = 4.5V$ ; $T_{amb} = 25^{\circ}C^{(b)}$	2.4
		@ $V_{GS} = 4.5V$ ; $T_{amb} = 70^{\circ}C^{(b)}$	1.9
		@ $V_{GS} = 4.5V$ ; $T_{amb} = 25^{\circ}C^{(a)}$	2.1
Pulsed drain current <sup>(c)</sup>	$I_{DM}$	11.8	A
Continuous source current (body diode) <sup>(b)</sup>	$I_S$	1.4	A
Pulsed source current (body diode) <sup>(c)</sup>	$I_{SM}$	11.8	A
Power dissipation at $T_{amb} = 25^{\circ}C^{(a)}$	$P_D$	625	mW
Linear derating factor		5	mW/ $^{\circ}C$
Power dissipation at $T_{amb} = 25^{\circ}C^{(b)}$	$P_D$	806	mW
Linear derating factor		6.4	mW/ $^{\circ}C$
Operating and storage temperature range	$T_j, T_{stg}$	-55 to +150	$^{\circ}C$

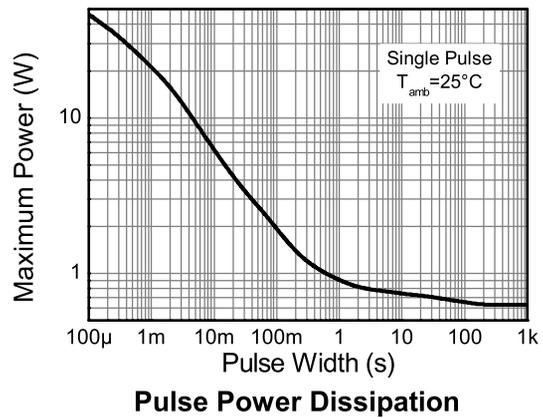
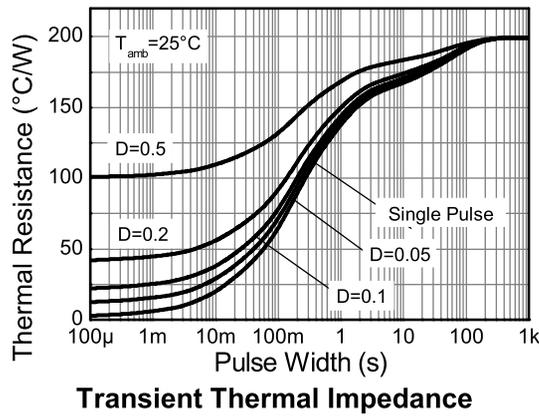
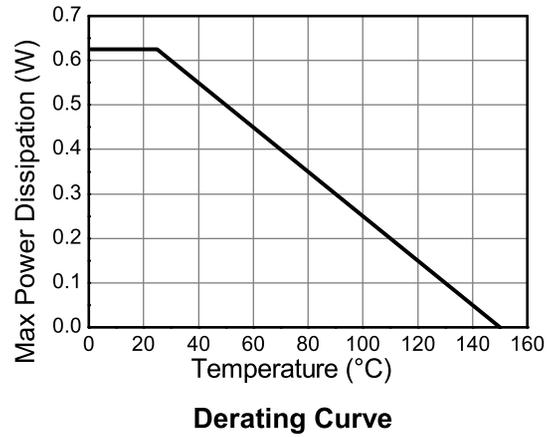
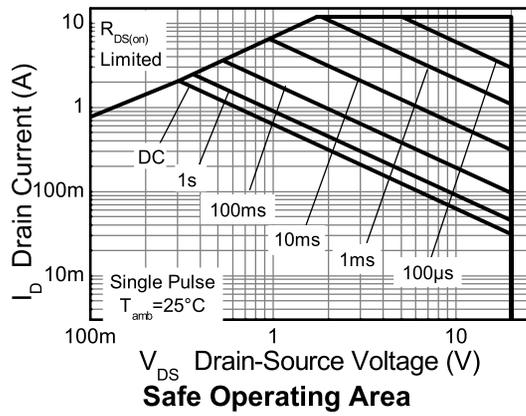
### Thermal resistance

Parameter	Symbol	Limit	Unit
Junction to ambient <sup>(a)</sup>	$R_{\theta JA}$	200	$^{\circ}C/W$
Junction to ambient <sup>(b)</sup>	$R_{\theta JA}$	155	$^{\circ}C/W$

#### 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  $t \leq 5$  sec.
- (c) Repetitive rating - 25mm x 25mm FR4 PCB,  $D=0.02$ , pulse width 300 $\mu s$  - pulse width limited by maximum junction temperature.

**Thermal characteristics**



**Electrical characteristics (at  $T_{amb} = 25^{\circ}\text{C}$  unless otherwise stated)**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
<b>Static</b>						
Drain-source breakdown voltage	$V_{(BR)DSS}$	20			V	$I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$
Zero gate voltage drain current	$I_{DSS}$			1	$\mu\text{A}$	$V_{DS} = 20\text{V}$ , $V_{GS} = 0\text{V}$
Gate-body leakage	$I_{GSS}$			100	nA	$V_{GS} = \pm 8\text{V}$ , $V_{DS} = 0\text{V}$
Gate-source threshold voltage	$V_{GS(th)}$	0.4		1.0	V	$I_D = 250\mu\text{A}$ , $V_{DS} = V_{GS}$
Static drain-source on-state resistance <sup>(*)</sup>	$R_{DS(on)}$			0.100	$\Omega$	$V_{GS} = 4.5\text{V}$ , $I_D = 2.4\text{A}$
				0.150	$\Omega$	$V_{GS} = 2.5\text{V}$ , $I_D = 2.0\text{A}$
				0.200	$\Omega$	$V_{GS} = 1.8\text{V}$ , $I_D = 1.7\text{A}$
Forward transconductance <sup>(*)(‡)</sup>	$g_{fs}$		6.1		S	$V_{DS} = 10\text{V}$ , $I_D = 2.4\text{A}$
<b>Dynamic<sup>(‡)</sup></b>						
Input capacitance	$C_{iss}$		370		pF	$V_{DS} = 10\text{V}$ , $V_{GS} = 0\text{V}$ $f = 1\text{MHz}$
Output capacitance	$C_{oss}$		81		pF	
Reverse transfer capacitance	$C_{rss}$		46		pF	
<b>Switching<sup>(†) (‡)</sup></b>						
Turn-on-delay time	$t_{d(on)}$		2.2		ns	$V_{DD} = 10\text{V}$ , $V_{GS} = 4.5\text{V}$ $I_D = 1\text{A}$ $R_G \approx 6.0\Omega$
Rise time	$t_r$		3.6		ns	
Turn-off delay time	$t_{d(off)}$		17.8		ns	
Fall time	$t_f$		10.5		ns	
Total gate charge	$Q_g$		4.8		nC	$V_{DS} = 10\text{V}$ , $V_{GS} = 4.5\text{V}$ $I_D = 2.4\text{A}$
Gate-source charge	$Q_{gs}$		0.6		nC	
Gate drain charge	$Q_{gd}$		1.0		nC	
<b>Source-drain diode</b>						
Diode forward voltage <sup>(*)</sup>	$V_{SD}$		0.73	0.95	V	$T_j = 25^{\circ}\text{C}$ , $I_S = 1.2\text{A}$ , $V_{GS} = 0\text{V}$
Reverse recovery time <sup>(‡)</sup>	$t_{rr}$		6.7		ns	$T_j = 25^{\circ}\text{C}$ , $I_F = 1.1\text{A}$ , $di/dt = 100\text{A/ms}$
Reverse recovery charge <sup>(‡)</sup>	$Q_{rr}$		1.3		nC	

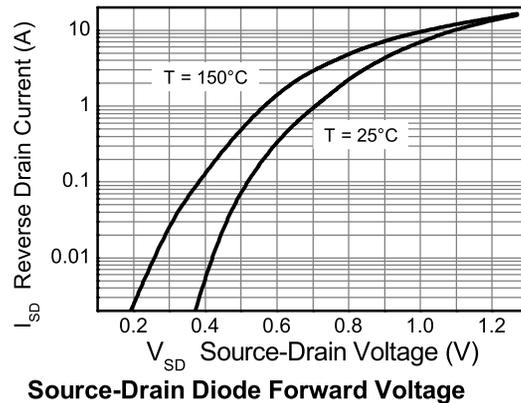
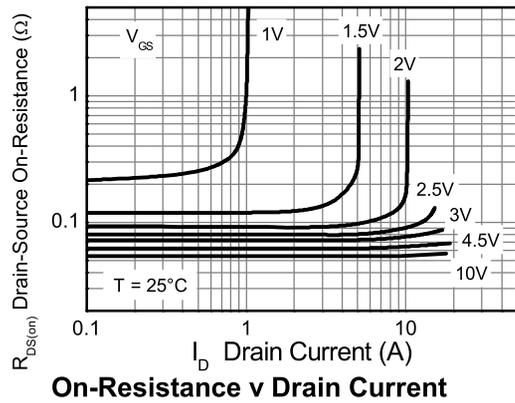
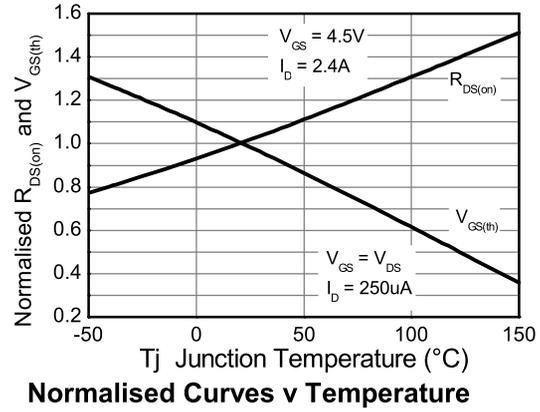
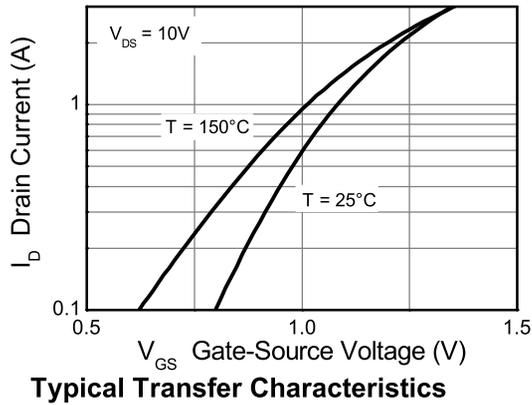
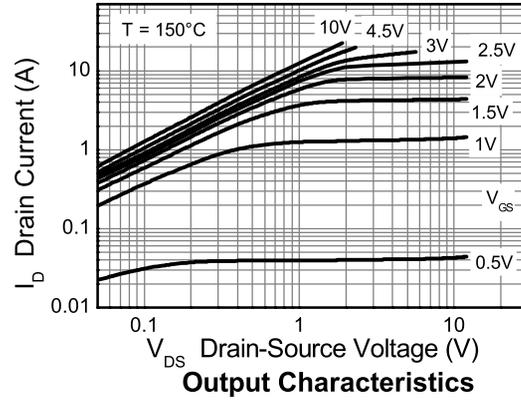
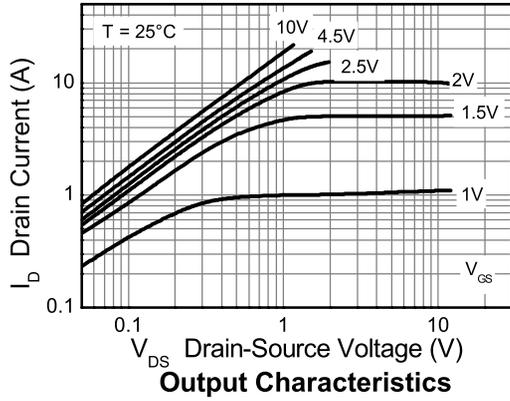
**NOTES:**

(\*) Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ ; duty cycle  $\leq 2\%$ .

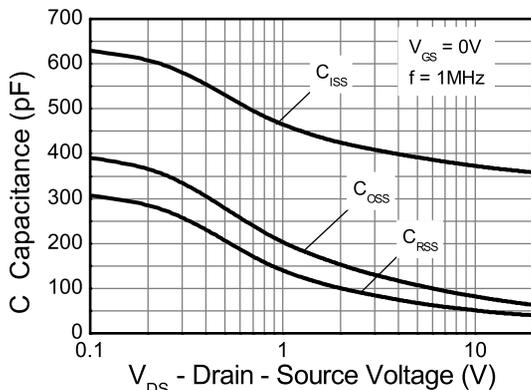
(†) Switching characteristics are independent of operating junction temperature.

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

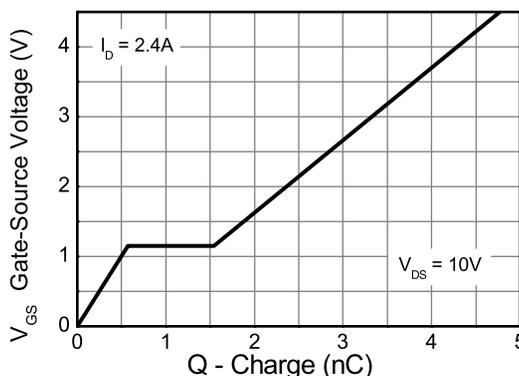
Typical characteristics



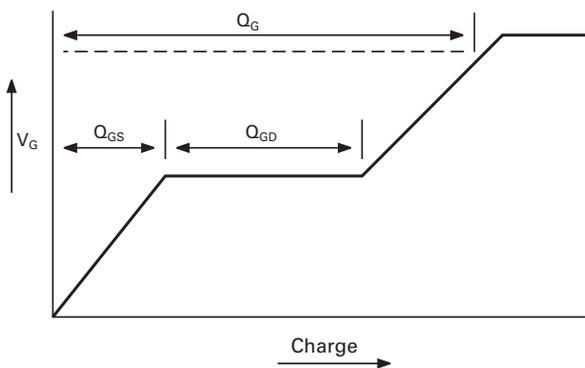
**Typical characteristics**



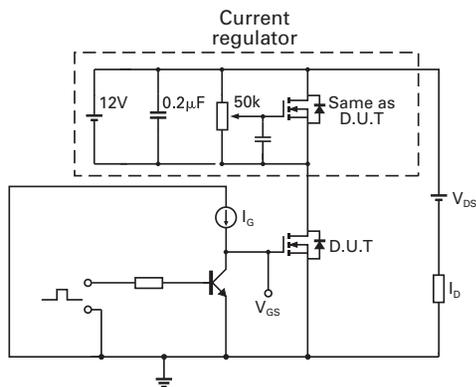
**Capacitance v Drain-Source Voltage**



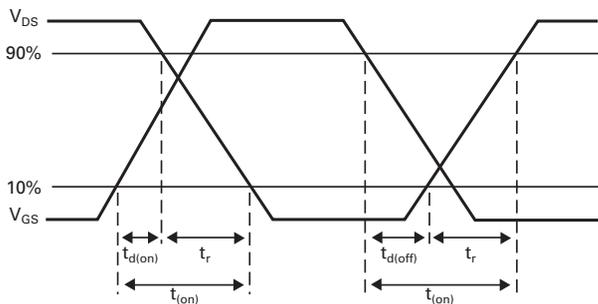
**Gate-Source Voltage v Gate Charge**



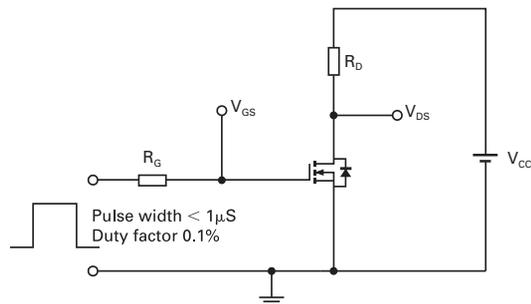
**Basic gate charge waveform**



**Gate charge test circuit**

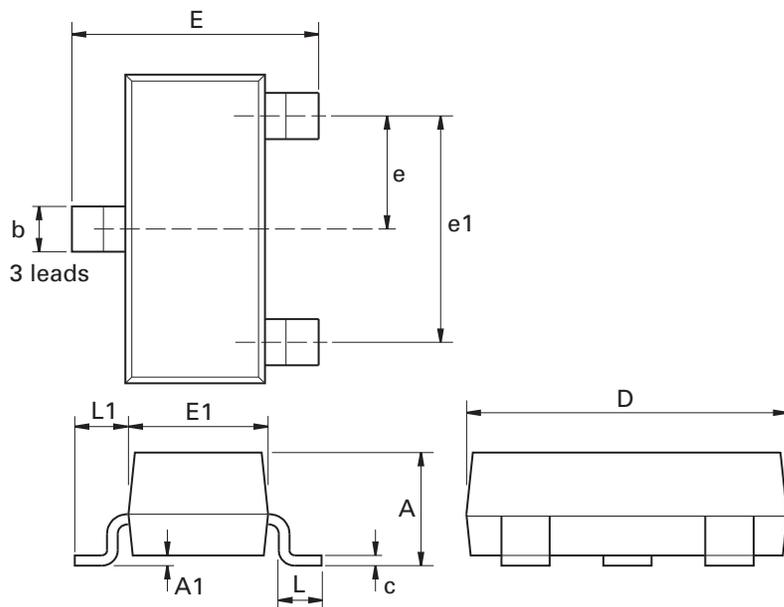


**Switching time waveforms**



**Switching time test circuit**

Package outline - SOT23



Dim.	Millimeters		Inches		Dim.	Millimeters		Inches	
	Min.	Max.	Min.	Max.		Min.	Max.	Max.	Max.
A	-	1.12	-	0.044	e1	1.90 NOM		0.075 NOM	
A1	0.01	0.10	0.0004	0.004	E	2.10	2.64	0.083	0.104
b	0.30	0.50	0.012	0.020	E1	1.20	1.40	0.047	0.055
C	0.085	0.120	0.003	0.008	L	0.25	0.62	0.018	0.024
D	2.80	3.04	0.110	0.120	L1	0.45	0.62	0.018	0.024
e	0.95 NOM		0.0375 NOM		-	-	-	-	-

Note: Controlling dimensions are in millimeters. Approximate dimensions are provided in inches