



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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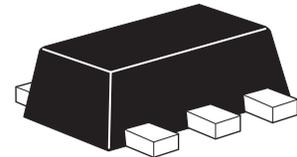
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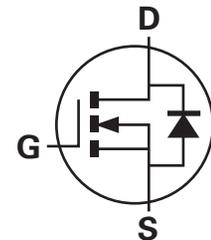
Summary

$V_{(BR)DSS}$	$R_{DS(on)}$ (Ω)	I_D (A)
60	0.250 @ $V_{GS}= 10V$	2.5
	0.350 @ $V_{GS}= 4.5V$	2.1



Description

This new generation trench MOSFET from Zetex utilizes a unique structure combining the benefits of low on-state resistance with fast switching speed.

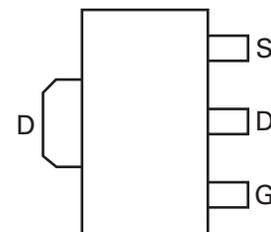


Features

- Low on-resistance
- Fast switching speed
- Low threshold
- SOT89 package

Applications

- DC-DC converters
- Power management functions
- Relay and solenoid driving
- Motor control



Top view

Ordering information

Device	Reel size (inches)	Tape width (mm)	Quantity per reel
NK-ZXMN6A07ZTA	7	12	1,000

Device marking

7N6

Absolute maximum ratings

Parameter	Symbol	Limit	Unit
Drain-source voltage	V_{DSS}	60	V
Gate-source voltage	V_{GS}	± 20	V
Continuous drain current @ $V_{GS}=10V$; $T_{amb}=25^{\circ}C^{(b)}$ @ $V_{GS}=10V$; $T_{amb}=70^{\circ}C^{(b)}$ @ $V_{GS}=10V$; $T_{amb}=25^{\circ}C^{(a)}$	I_D	2.5	A
		2.0	
		1.9	
Pulsed drain current ^(c)	I_{DM}	6.8	A
Continuous source current (body diode) ^(b)	I_S	3.3	A
Pulsed source current (body diode) ^(c)	I_{SM}	6.8	A
Power dissipation at $T_{amb}=25^{\circ}C^{(a)}$	P_D	1.5	W
Linear derating factor		12	mW/ $^{\circ}C$
Power dissipation at $T_{amb}=25^{\circ}C^{(b)}$	P_D	2.6	W
Linear derating factor		21	mW/ $^{\circ}C$

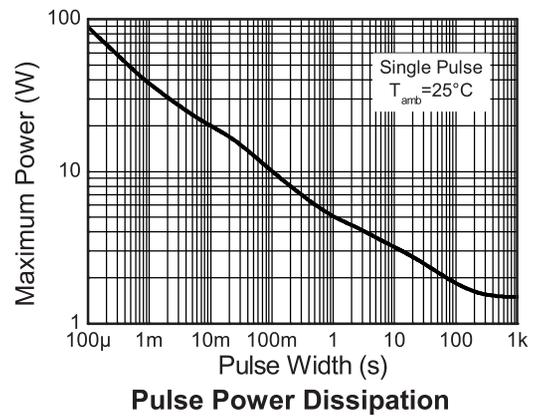
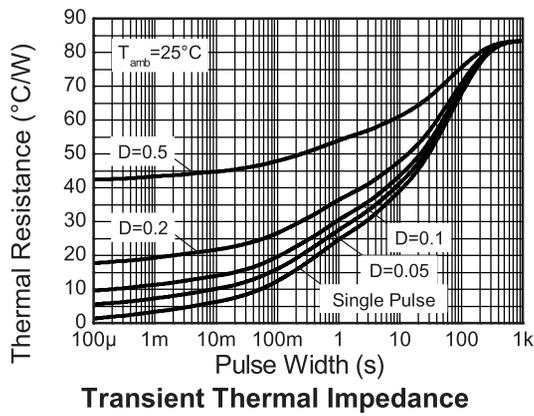
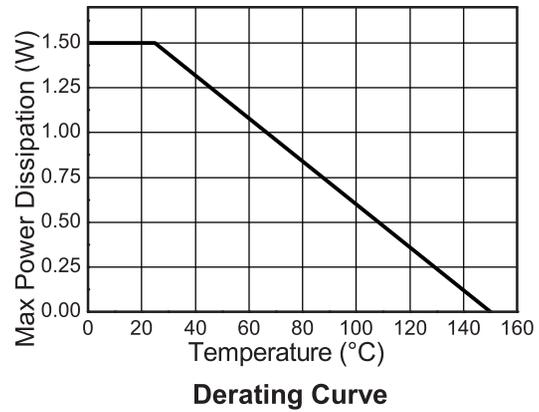
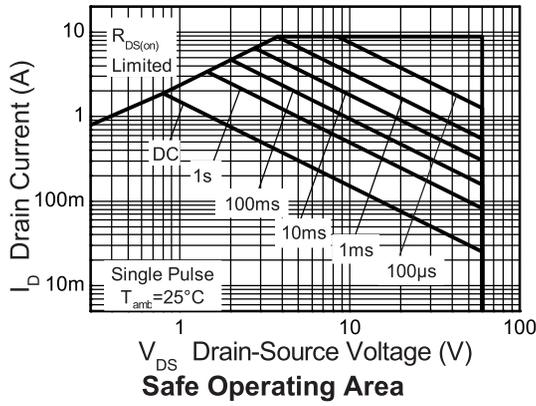
Thermal resistance

Parameter	Symbol	Limit	Unit
Junction to ambient	$R_{\theta JA}$	83.3	$^{\circ}C/W$
Junction to ambient	$R_{\theta JA}$	47.4	$^{\circ}C/W$

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 $t \leq 10$ sec.
- (c) Repetitive rating - 25mm x 25mm FR4 PCB, $D=0.02$, pulse width 300 μs - pulse width limited by maximum junction temperature.

Thermal characteristics



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

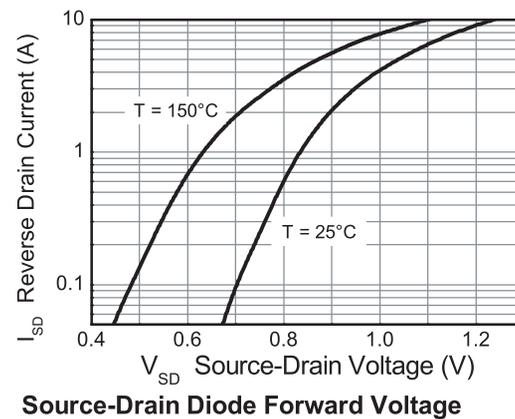
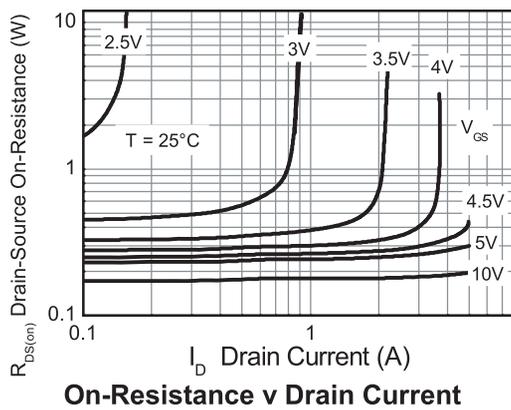
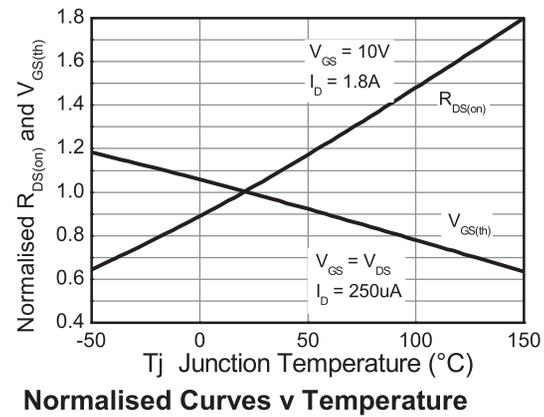
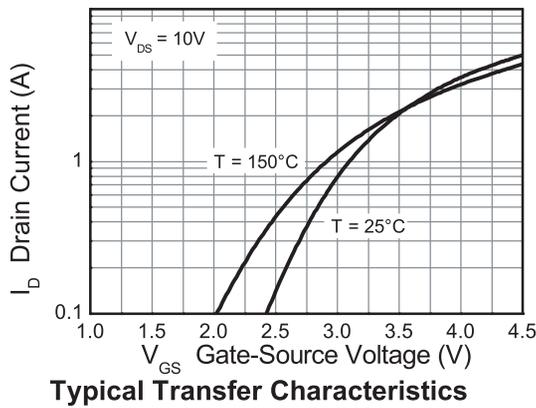
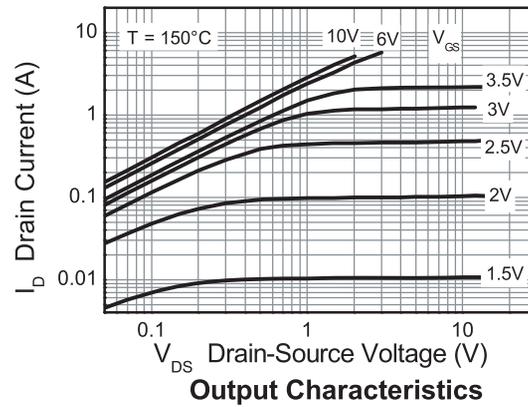
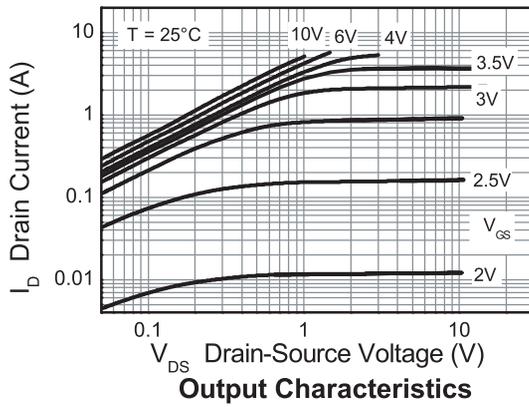
Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Static						
Drain-source breakdown voltage	$V_{(BR)DSS}$	60			V	$I_D = 250\mu\text{A}$, $V_{GS} = 0\text{V}$
Zero gate voltage drain current	I_{DSS}			1	μA	$V_{DS} = 60\text{V}$, $V_{GS} = 0\text{V}$
Gate-body leakage	I_{GSS}			100	nA	$V_{GS} = \pm 20\text{V}$, $V_{DS} = 0\text{V}$
Gate-source threshold voltage	$V_{GS(th)}$	1.0		3.0	V	$I_D = 250\mu\text{A}$, $V_{DS} = V_{GS}$
Static drain-source on-state resistance ^(*)	$R_{DS(on)}$			0.250	Ω	$V_{GS} = 10\text{V}$, $I_D = 1.8\text{A}$
				0.350	Ω	$V_{GS} = 4.5\text{V}$, $I_D = 1.3\text{A}$
Forward transconductance ^{(*)(‡)}	g_{fs}		2.3		S	$V_{DS} = 15\text{V}$, $I_D = 1.8\text{A}$
Dynamic^(‡)						
Input capacitance	C_{iss}		166		pF	$V_{DS} = 40\text{V}$, $V_{GS} = 0\text{V}$ $f = 1\text{MHz}$
Output capacitance	C_{oss}		19.5		pF	
Reverse transfer capacitance	C_{rss}		8.7		pF	
Switching^(†) (‡)						
Turn-on-delay time	$t_{d(on)}$		1.8		ns	$V_{DD} = 30\text{V}$, $V_{GS} = 10\text{V}$ $I_D = 1.8\text{A}$ $R_G \approx 6.0\Omega$
Rise time	t_r		1.4		ns	
Turn-off delay time	$t_{d(off)}$		4.9		ns	
Fall time	t_f		2.0		ns	
Total gate charge	Q_g		1.65			$V_{DS} = 30\text{V}$, $V_{GS} = 5\text{V}$ $I_D = 1.8\text{A}$
Total gate charge	Q_g		3.2		nC	$V_{DS} = 30\text{V}$, $V_{GS} = 10\text{V}$ $I_D = 1.8\text{A}$
Gate-source charge	Q_{gs}		0.67		nC	
Gate drain charge	Q_{gd}		0.82		nC	
Source-drain diode						
Diode forward voltage ^(*)	V_{SD}		0.80	0.95	V	$T_j = 25^{\circ}\text{C}$, $I_S = 0.45\text{A}$, $V_{GS} = 0\text{V}$
Reverse recovery time ^(‡)	t_{rr}		20.5		ns	$T_j = 25^{\circ}\text{C}$, $I_F = 1.8\text{A}$, $di/dt = 100\text{A}/\mu\text{s}$
Reverse recovery charge ^(‡)	Q_{rr}		21.3		nC	

NOTES:

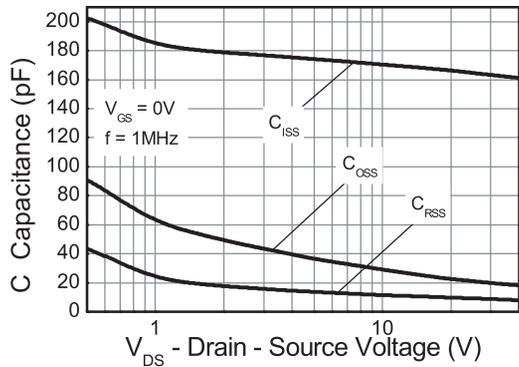
(*) Measured under pulsed conditions. Pulse width $\leq 300\mu\text{s}$; duty cycle $\leq 2\%$.

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

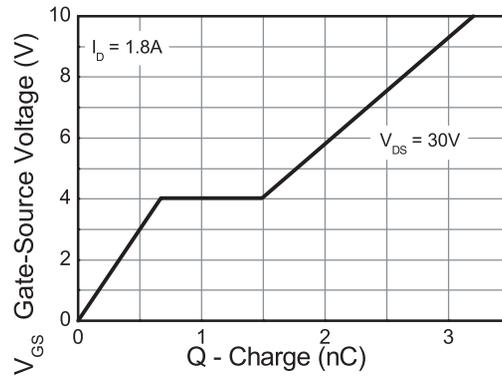
(‡) For design aid only, not subject to production testing.



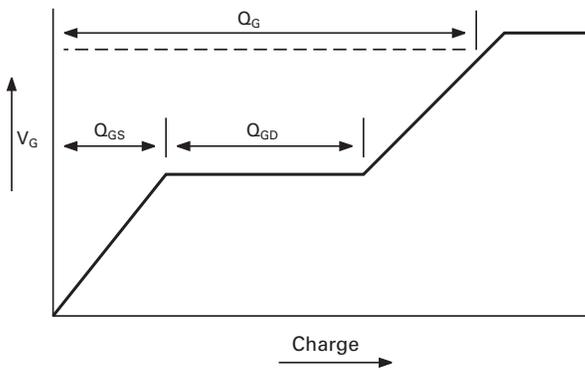
Typical characteristics



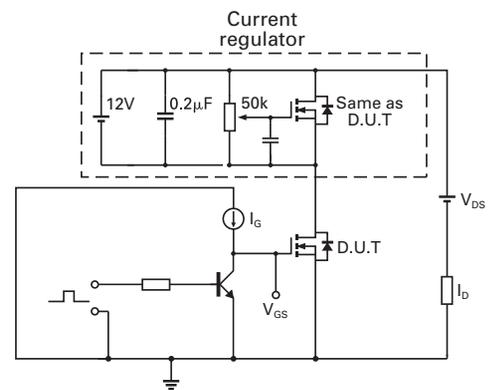
Capacitance v Drain Source Voltage



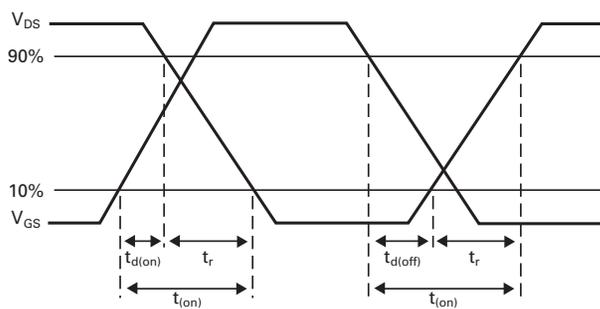
Gate-Source Voltage v Gate Charge



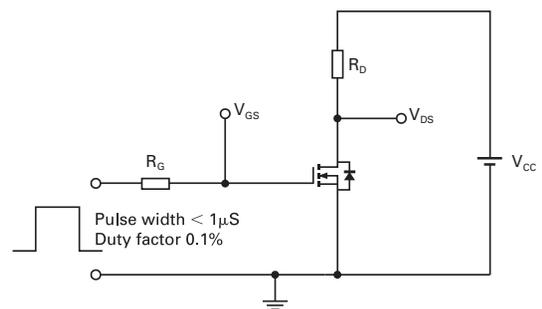
Basic gate charge waveform



Gate charge test circuit

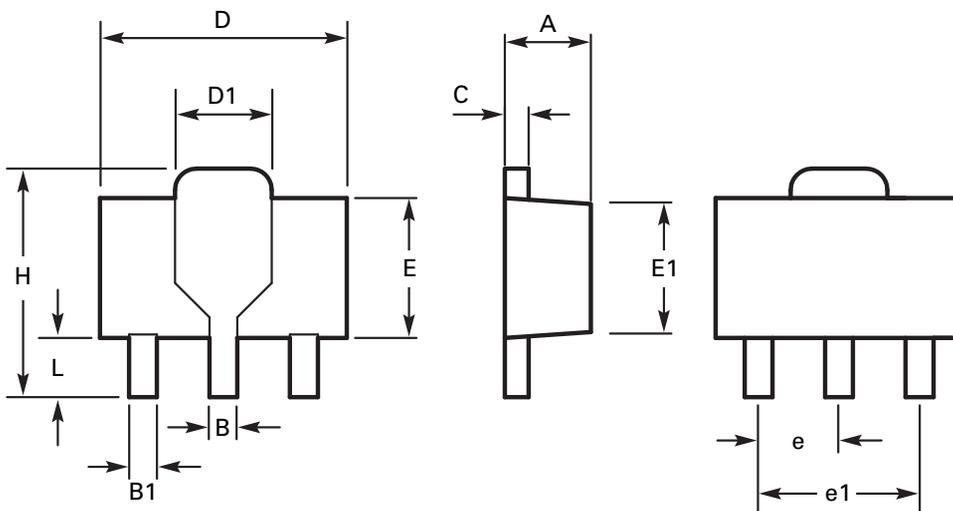


Switching time waveforms



Switching time test circuit

Package outline - SOT89



DIM	Millimeters		Inches		DIM	Millimeters		Inches	
	Min	Max	Min	Max		Min	Max	Min	Max
A	1.40	1.60	0.550	0.630	E	2.29	2.60	0.090	0.102
B	0.44	0.56	0.017	0.022	E1	2.13	2.29	0.084	0.090
B1	0.36	0.48	0.014	0.019	e	1.50 BSC		0.059 BSC	
C	0.35	0.44	0.014	0.017	e1	3.00 BSC		0.118 BSC	
D	4.40	4.60	0.173	0.181	H	3.94	4.25	0.155	0.167
D1	1.62	1.83	0.064	0.072	L	0.89	1.20	0.035	0.047

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