

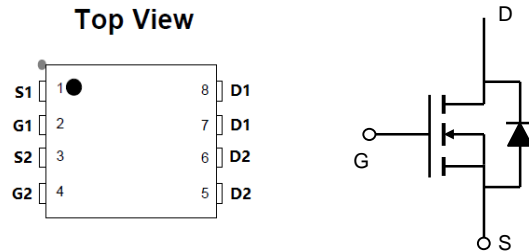
## 20V N-Channel MOSFET

### General Description

The FNK3328E uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 0.5V while retaining a 12V  $V_{GS(MAX)}$  rating. This device is suitable for use as load switch and general purpose FET application.

### Product Summary

$V_{DS} (V) = 20V$   
 $I_D = 10A (V_{GS} = 4.5V)$   
 $R_{DS(ON)} < 9m\Omega (V_{GS} = 4.5V)$   
 $R_{DS(ON)} < 12m\Omega (V_{GS} = 2.5V)$



**Marking and pin Assignment**

Absolute Maximum Ratings $T_A=25^\circ\text{C}$ unless otherwise noted			
Parameter	Symbol	Maximum	Units
Drain-Source Voltage	$V_{DS}$	20	V
Gate-Source Voltage	$V_{GS}$	$\pm 12$	V
Continuous Drain Current <sup>A</sup>	$T_A=25^\circ\text{C}$	10	A
	$T_A=70^\circ\text{C}$	9.2	
Pulsed Drain Current <sup>B</sup>	$I_{DM}$	40	
Power Dissipation <sup>A</sup>	$T_A=25^\circ\text{C}$	3.1	W
	$T_A=70^\circ\text{C}$	2	
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 150	$^\circ\text{C}$

Thermal Characteristics					
Parameter	Symbol	Typ	Max	Units	
Maximum Junction-to-Ambient <sup>A</sup>	$R_{\theta JA}$	30	40	$^\circ\text{C/W}$	
Maximum Junction-to-Ambient <sup>A</sup>		65	80		
Maximum Junction-to-Lead <sup>C</sup>	$R_{\theta JL}$	20	25	$^\circ\text{C/W}$	

**Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)**

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V	20			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =16V, V <sub>GS</sub> =0V T <sub>J</sub> =55°C			10 25	μA
I <sub>GSS</sub>	Gate-Body leakage current	V <sub>DS</sub> =0V, V <sub>GS</sub> =±10V			10	μA
BV <sub>GSO</sub>	Gate-Source Breakdown Voltage	V <sub>DS</sub> =0V, I <sub>G</sub> =±250μA	±12			V
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> I <sub>D</sub> =250μA	0.5	0.78	1	V
I <sub>D(ON)</sub>	On state drain current	V <sub>GS</sub> =4.5V, V <sub>DS</sub> =5V	40			A
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =4.5V, I <sub>D</sub> =12A T <sub>J</sub> =125°C		7.1 11	9 16	mΩ
		V <sub>GS</sub> =2.5V, I <sub>D</sub> =10.5A		8.5	12	mΩ
		V <sub>GS</sub> =1.8V, I <sub>D</sub> =8.5A		14	19	mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =12A		37		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =1A, V <sub>GS</sub> =0V		0.73	1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				4.8	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =10V, f=1MHz		1810		pF
C <sub>oss</sub>	Output Capacitance			232		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			200		pF
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz		1.6		Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g</sub>	Total Gate Charge	V <sub>GS</sub> =4.5V, V <sub>DS</sub> =10V, I <sub>D</sub> =12A		17.9		nC
Q <sub>gs</sub>	Gate Source Charge			1.5		nC
Q <sub>gd</sub>	Gate Drain Charge			4.7		nC
t <sub>D(on)</sub>	Turn-On DelayTime	V <sub>GS</sub> =10V, V <sub>DS</sub> =10V, R <sub>L</sub> =1.0Ω, R <sub>GEN</sub> =3Ω		2.5		ns
t <sub>r</sub>	Turn-On Rise Time			7.2		ns
t <sub>D(off)</sub>	Turn-Off DelayTime			49		ns
t <sub>f</sub>	Turn-Off Fall Time			10.8		ns
t <sub>rr</sub>	Body Diode Reverse Recovery Time		I <sub>F</sub> =12A, dI/dt=100A/μs		20.2	
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =12A, dI/dt=100A/μs		8		nC

A: The value of R<sub>θJA</sub> is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25°C. The value in any given application depends on the user's specific board design. The current rating is based on the t ≤ 10s thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C. The R<sub>θJA</sub> is the sum of the thermal impedance from junction to lead R<sub>θJL</sub> and lead to ambient.

D. The static characteristics in Figures 1 to 6 are obtained using 300 μs pulses, duty cycle 0.5% max.

E. These tests are performed with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25°C. The SOA

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

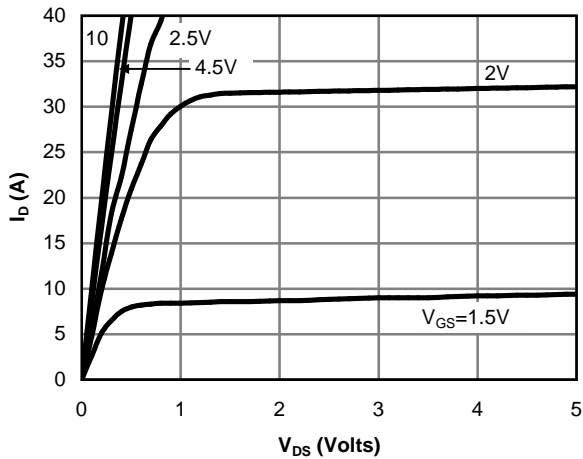


Fig 1: On-Region Characteristics

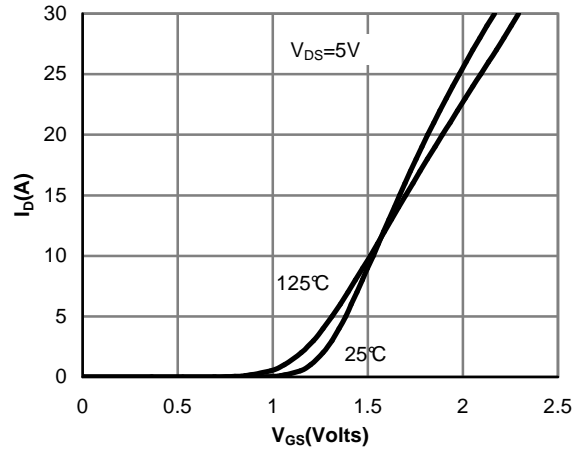


Figure 2: Transfer Characteristics

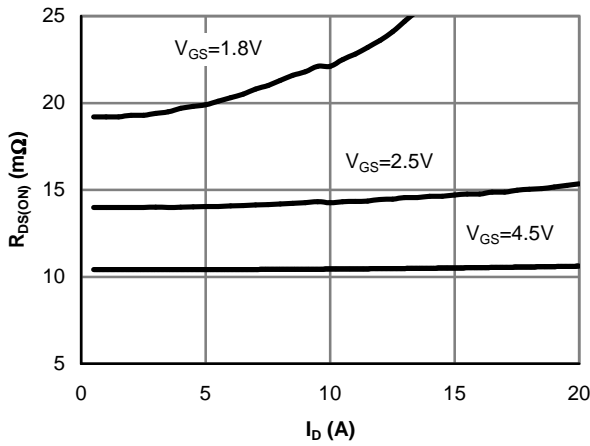


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

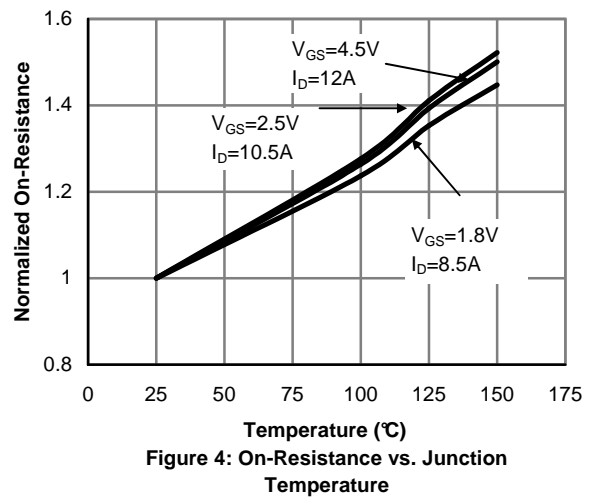


Figure 4: On-Resistance vs. Junction Temperature

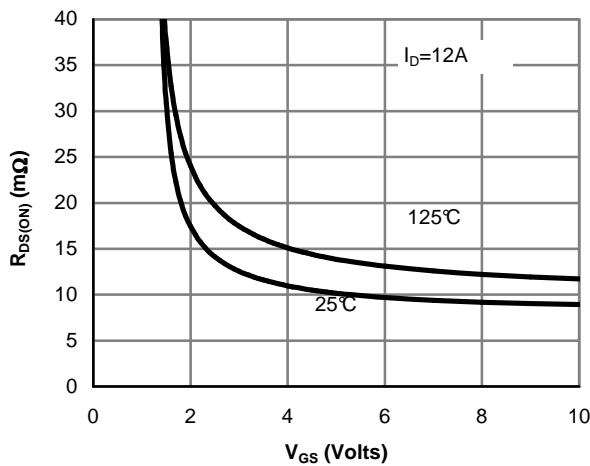


Figure 5: On-Resistance vs. Gate-Source Voltage

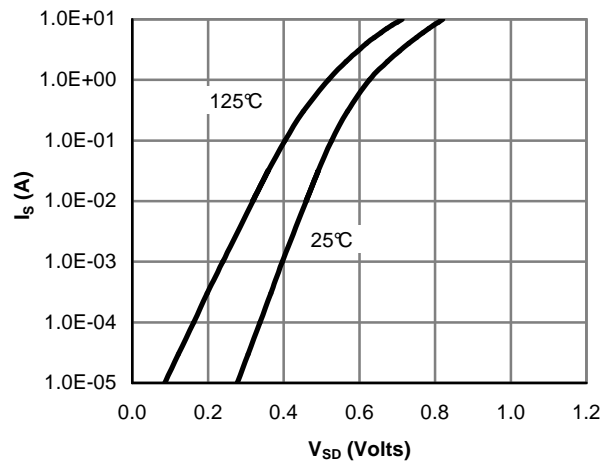


Figure 6: Body-Diode Characteristics

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

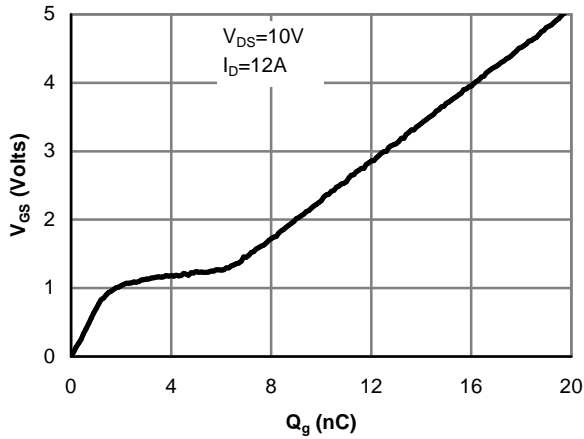


Figure 7: Gate-Charge Characteristics

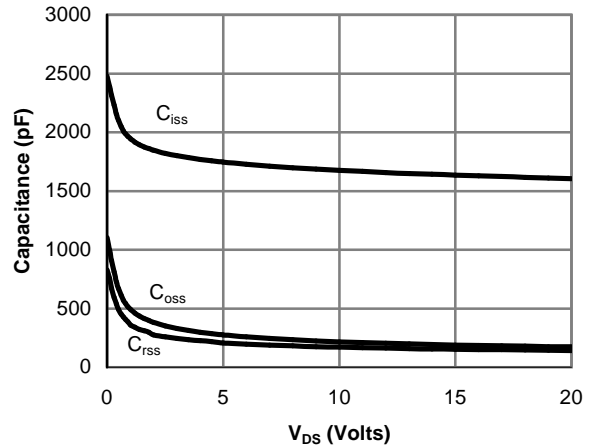


Figure 8: Capacitance Characteristics

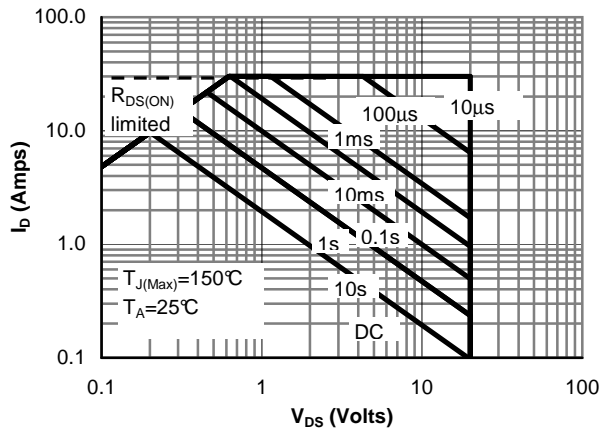


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

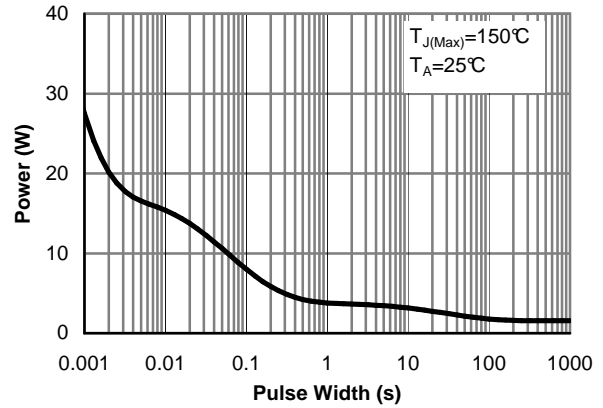


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

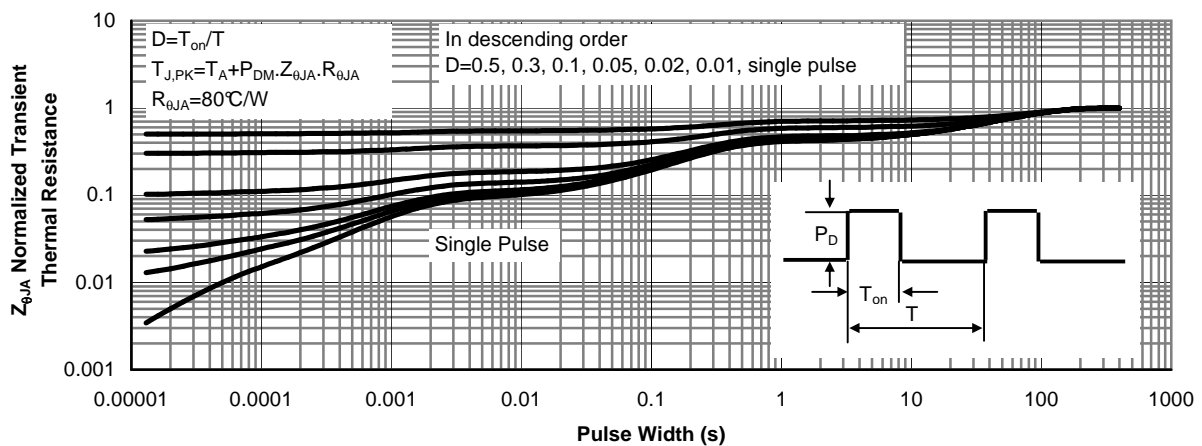
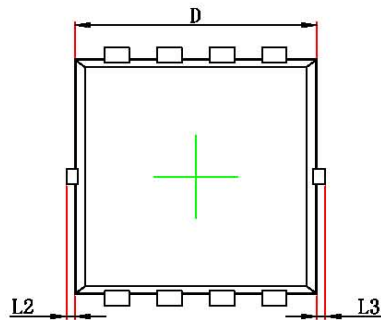
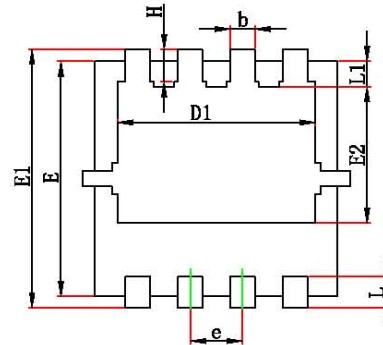


Figure 11: Normalized Maximum Transient Thermal Impedance

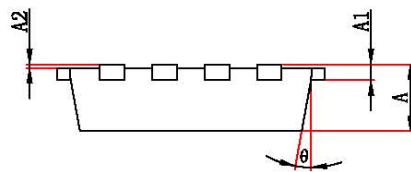
## PDFNWB( 3 × 3 )-8L(P0.65T0.80) PACKAGE OUTLINE DIMENSIONS



**Top View**  
[顶视图]



**Bottom View**  
[背视图]



**Side View**  
[侧视图]

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.650	0.850	0.026	0.033
A1	0.152 REF.		0.006 REF.	
A2	0~0.05		0~0.002	
D	2.900	3.100	0.114	0.122
D1	2.300	2.600	0.091	0.102
E	2.900	3.100	0.114	0.122
E1	3.150	3.450	0.124	0.136
E2	1.535	1.935	0.060	0.076
b	0.200	0.400	0.008	0.016
e	0.550	0.750	0.022	0.030
L	0.300	0.500	0.012	0.020
L1	0.180	0.480	0.007	0.019
L2	0~0.100		0~0.004	
L3	0~0.100		0~0.004	
H	0.315	0.515	0.012	0.020
θ	9°	13°	9°	13°

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