

**SuperMOS –PDFN3\*3-8L 45V BV<sub>DSS</sub> 16mΩ R<sub>DS(on)</sub> 36A I<sub>D</sub>, N-channel MOSFET**

**1. Description**

The ESN4186 is N-Channel enhancement MOS Field Effect Transistor. Uses advanced trench technology and design to provide excellent R<sub>DS(ON)</sub> with low gate charge. Device is suitable for use in DC-DC conversion, power switch and charging circuit. Standard Product ESN4186 is Pb-free.

**2. Features**

- 45V, R<sub>DS(ON)</sub>=16mΩ(Typ), V<sub>GS</sub>=10V  
R<sub>DS(ON)</sub>=21mΩ(Typ), V<sub>GS</sub>=4.5V
- Use trench MOSFET technology
- High density cell design for low R<sub>DS(on)</sub>
- Material: Halogen free
- Reliable and rugged
- Avalanche Rated
- Low leakage current

**3. Applications**

- PWM applications
- Load switch
- Power management in portable/desktop PCs
- DC/DC conversion

**100% UIS TESTED**

**4. Ordering Information**

Part Number	Package	Marking	Material	Packing	Quantity per reel	Flammability Rating	Reel Size
ESN4186	PDFN3*3-8L	ESN4186/lot	Halogen free	Tape & Reel	5,000 PCS	UL 94V-0	13 inches

Table-1 Ordering information

**5. Pin Configuration and Functions**


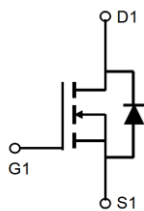
Pin	Function	Outline	Circuit Diagram
1/2/3	Source		
4	Gate		
5/6/7/8	Drain		

Table-2 Pin configuration

## 6. Specification

### Absolute Maximum Rating & Thermal Characteristics

Ratings at 25 °C ambient temperature unless otherwise specified.

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$BV_{DSS}$	45	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current	$I_D$	$T_C=25^\circ\text{C}$	36
		$T_C=75^\circ\text{C}$	28
Maximum Power Dissipation	$P_D$	$T_C=25^\circ\text{C}$	42
		$T_C=75^\circ\text{C}$	25
Pulsed Drain Current <sup>a</sup>	$I_{DM}$	144	A
Avalanche Current, Single Pulsed <sup>b</sup>	$I_{AS}$	19	A
Avalanche Energy, Single Pulsed <sup>b</sup>	$E_{AS}$	54	mJ
Operating Junction Temperature	$T_J$	150	°C
Lead Temperature	$T_L$	260	°C
Storage Temperature Range	$T_{stg}$	-55 to 150	°C

#### Thermal resistance ratings

Single Operation					
Parameter	Symbol	Typical	Maximum	Unit	
Junction-to-Case Thermal Resistance <sup>a</sup>	$t \leq 10 \text{ s}$	$R_{\theta JC}$	2.5	3	°C/W

Note:

a: Surface mounted on FR4 Board using 1 square inch pad size, 1oz copper

b:  $T_J=25^\circ\text{C}$ ,  $V_{DD}=45\text{V}$ ,  $V_G=10\text{V}$ ,  $L=0.3\text{mH}$ ,  $R_g=25\Omega$

## Electrical Characteristics

At TA = 25°C unless otherwise specified

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>OFF CHARACTERISTICS</b>						
Drain-to-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	45			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=45V, V_{GS}=0V$			1.0	$\mu A$
Gate-to-source Leakage Current	$I_{GSS}$	$V_{DS}=0V, V_{GS}=\pm 20V$			$\pm 100$	nA
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS}=V_{DS}, I_D=250\mu A$	1.0	1.4	1.8	V
Drain-to-source On-resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=20A$		16	21	m $\Omega$
		$V_{GS}=4.5V, I_D=15A$		21	29	
Forward Trans conductance	$g_{FS}$	$V_{DS}=5.0V, I_D=20A$			80	S
<b>CHARGES, CAPACITANCES AND GATE RESISTANCE</b>						
Input Capacitance	$C_{ISS}$	$V_{GS}=0V, f=1MHz, V_{DS}=20V$		980		pF
Output Capacitance	$C_{OSS}$			130		
Reverse Transfer Capacitance	$C_{RSS}$			80		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS}=10V, V_{DS}=20V, I_D=20A$		17		nC
Gate-to-Source Charge	$Q_{GS}$			2.5		
Gate-to-Drain Charge	$Q_{GD}$			4.5		
<b>SWITCHING CHARACTERISTICS</b>						
Turn-On Delay Time	$t_{d(ON)}$	$V_{GS}=10V, V_{DS}=20V, R_L=1.5\Omega, R_{GEN}=3\Omega$		6.5		ns
Rise Time	$t_r$			17.6		
Turn-Off Delay Time	$t_{d(OFF)}$			19.8		
Fall Time	$t_f$			16.6		
<b>BODY DIODE CHARACTERISTICS</b>						
Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_S=1.0A$	0.45		1.2	V

7. Typical Characteristic

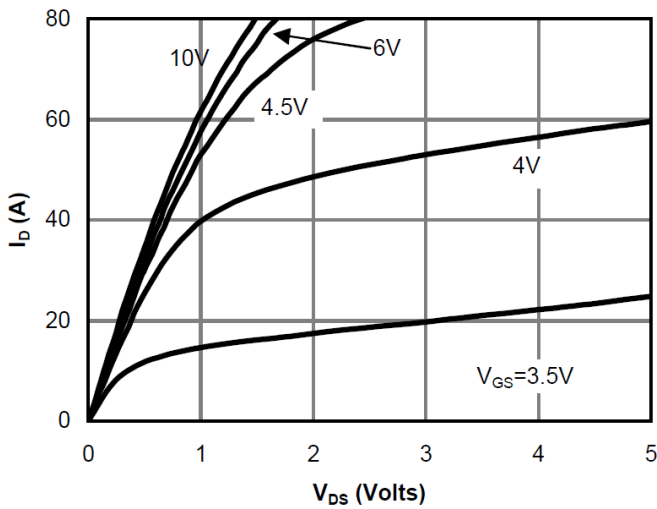


Fig 1: On-Region Characteristics

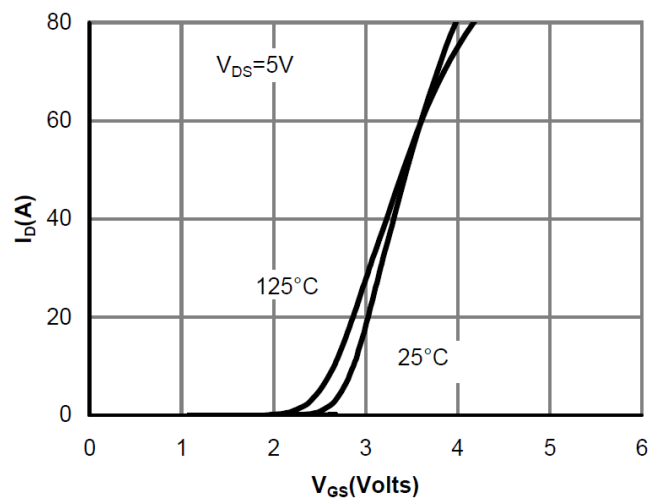


Figure 2: Transfer Characteristics

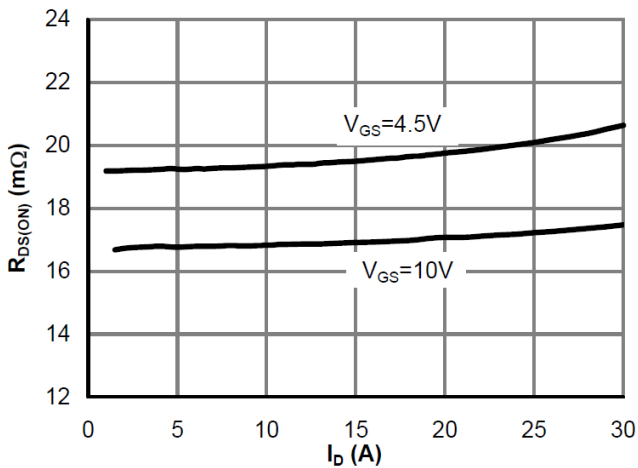


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

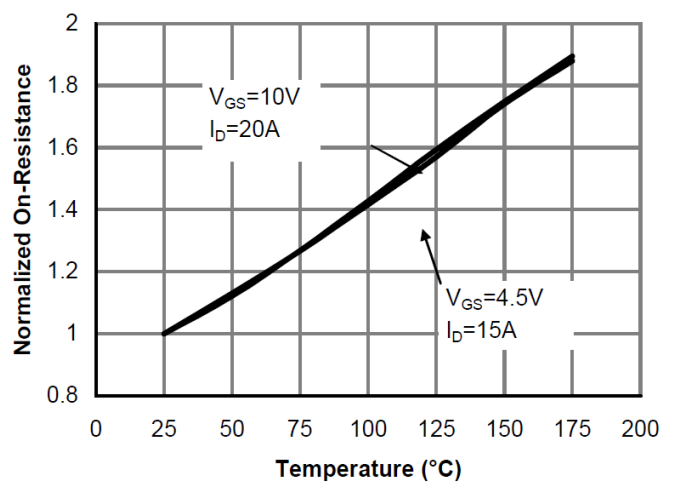


Figure 4: On-Resistance vs. Junction Temperature

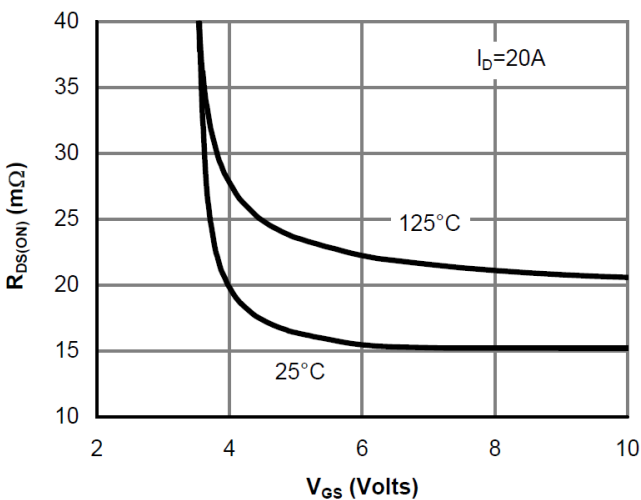


Figure 5: On-Resistance vs. Gate-Source Voltage

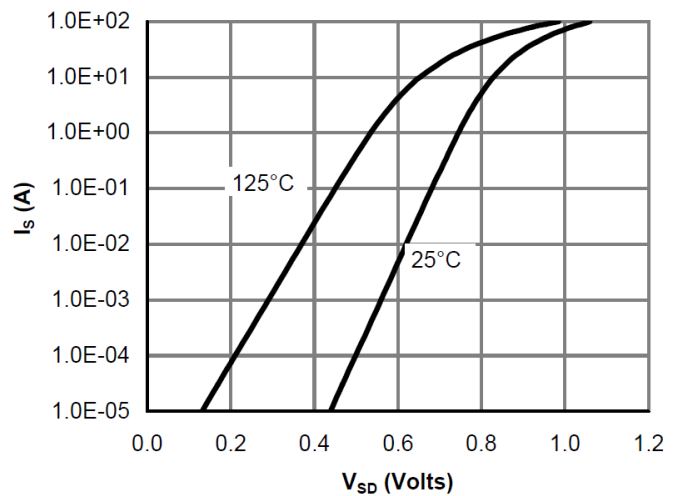


Figure 6: Body-Diode Characteristics

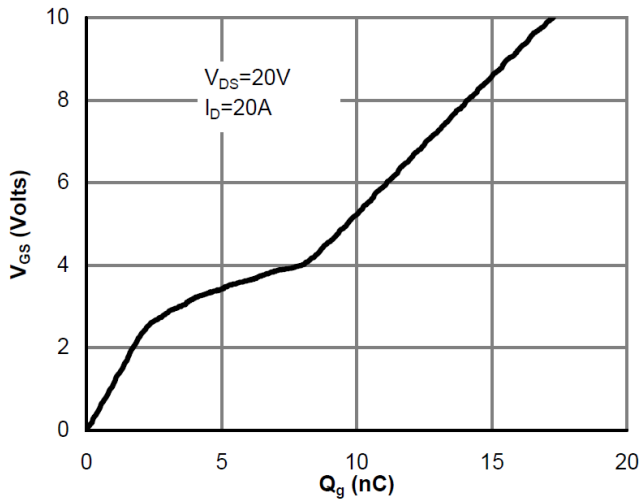


Figure 7: Gate-Charge Characteristics

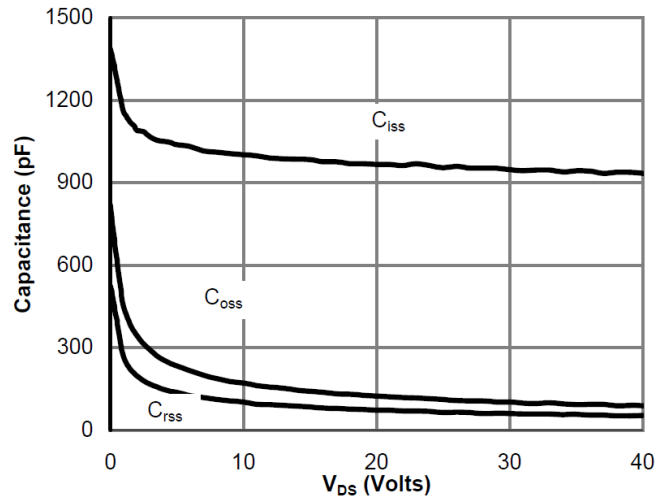


Figure 8: Capacitance Characteristics

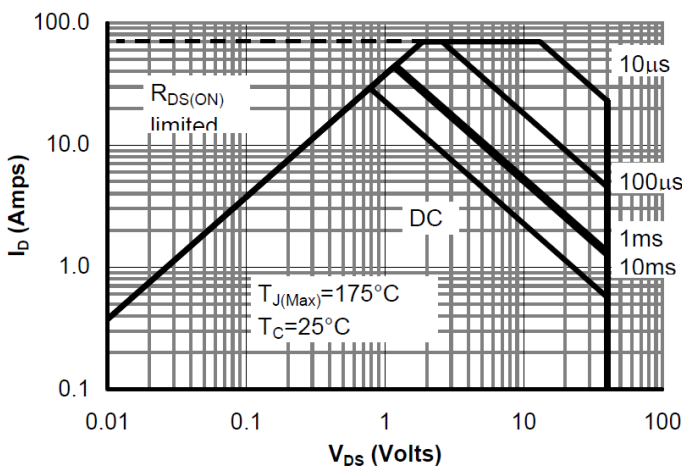


Figure 9: Maximum Forward Biased Safe Operating Area

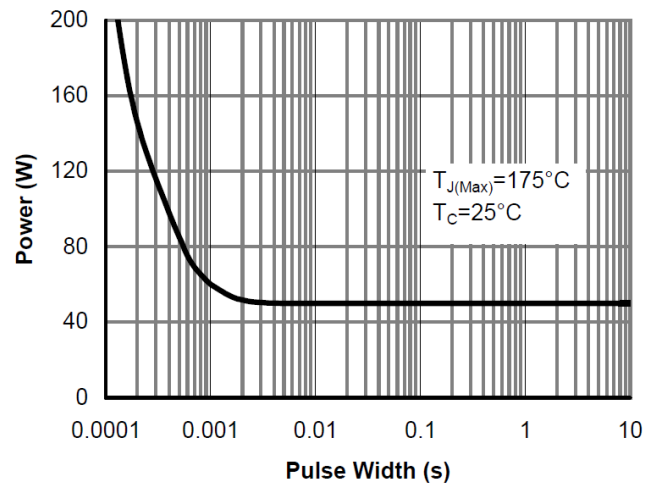


Figure 10: Single Pulse Power Rating Junction-to-Case

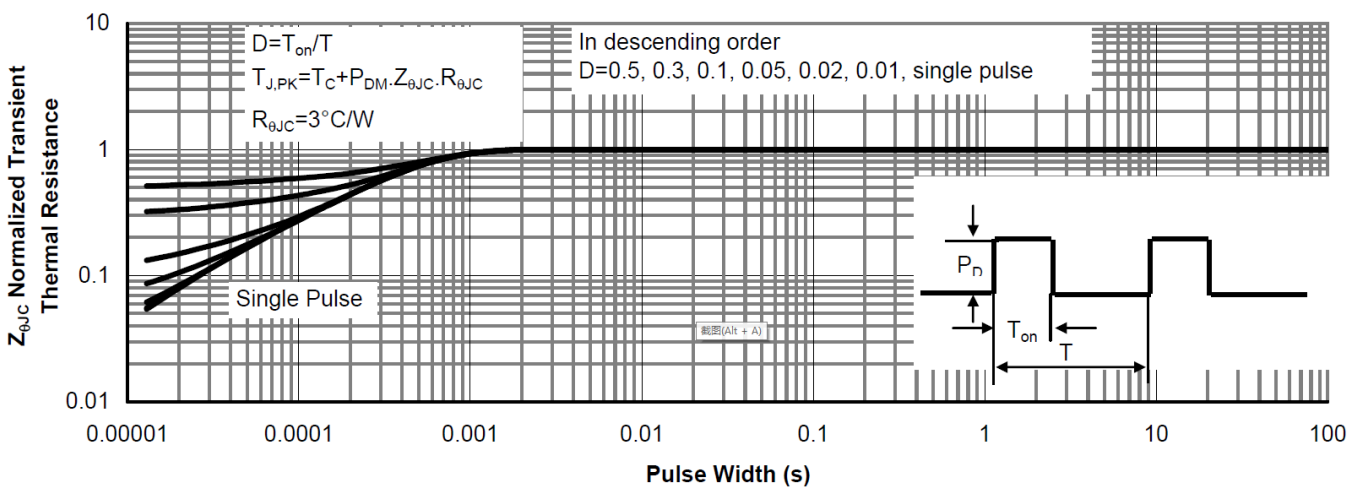
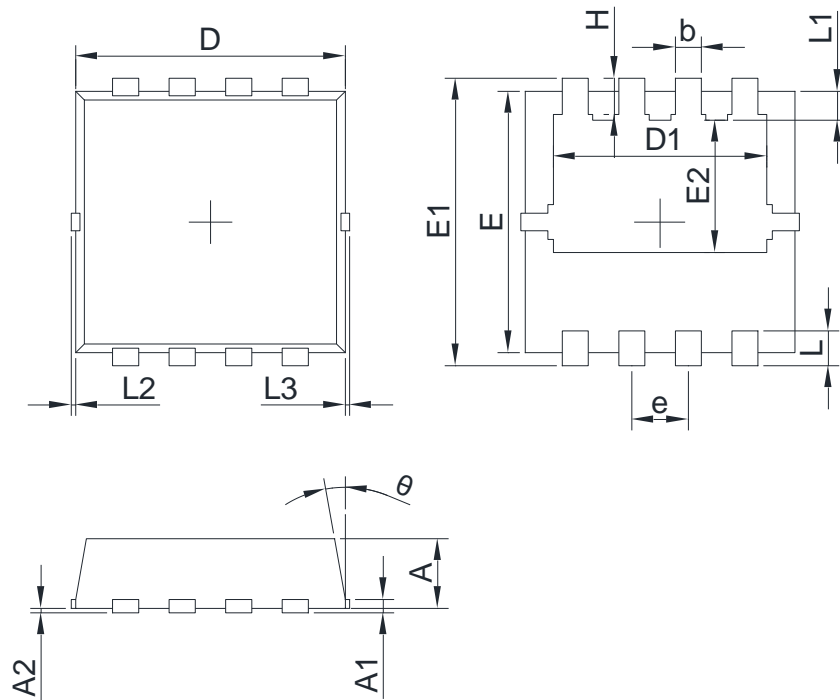


Figure 11: Normalized Maximum Transient Thermal Impedance

8. Dimension (PDFN3\*3-8L)



Unit: mm

COMMON DIMENSIONS: UNITS OF MEASURE=MILLIMETER

SYMBOL	MILLIMETER			SYMBOL	MILLIMETER		
	MIN	Typ.	MAX		MIN	Typ.	MAX
A	0.700	0.800	0.900	b	0.200	0.300	0.400
A1	0.152 REF.			e	0.550	0.650	0.750
A2	0~0.05			L	0.300	0.400	0.500
D	3.000	3.100	3.200	L1	0.180	0.330	0.480
D1	2.300	2.450	2.600	L2	0~0.100		
E	2.900	3.000	3.100	L3	0~0.100		
E1	3.150	3.300	3.450	H	0.315	0.415	0.515

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