

**SuperMOS –TO-252 45V BV<sub>DSS</sub> 16mΩ R<sub>DS(on)</sub> 36A I<sub>D</sub>, N-channel MOSFET**

**1. Description**

The ESD4186 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 ESD4186 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
ESD4186	TO-252	ESD4186/lot	Halogen free	Tape & Reel	2,500 PCS	UL 94V-0	13 inches

Table-1 Ordering information

**5. Pin Configuration and Functions**

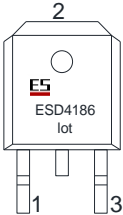
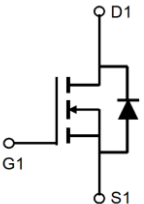
Pin	Function	Outline	Circuit Diagram
1	Gate		
2	Drain		
3	Source		

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	$T_C=25^\circ\text{C}$	$I_D$	36	A
	$T_C=75^\circ\text{C}$		28	
Maximum Power Dissipation	$T_C=25^\circ\text{C}$	$P_D$	42	W
	$T_C=75^\circ\text{C}$		25	
Pulsed Drain Current <sup>a</sup>		$I_{DM}$	144	A
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

## 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

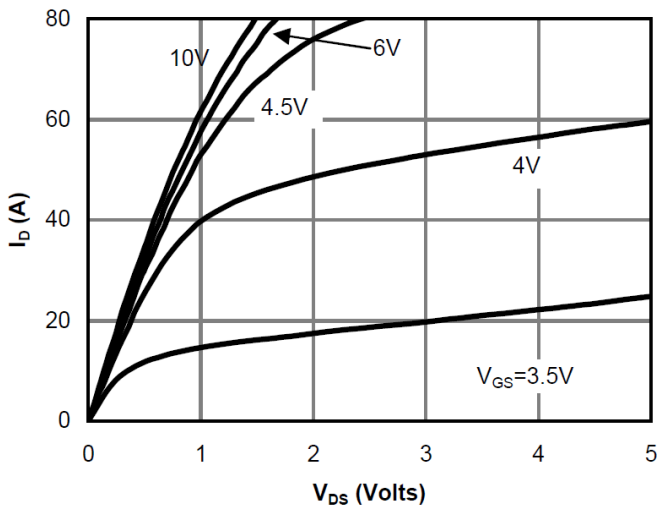


Fig 1: On-Region Characteristics

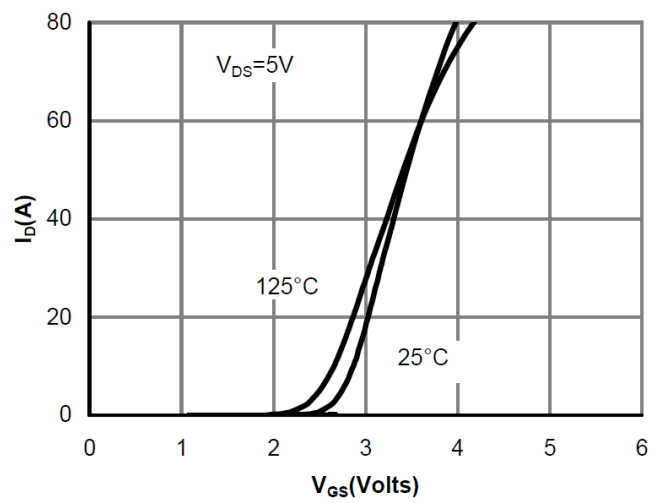


Figure 2: Transfer Characteristics

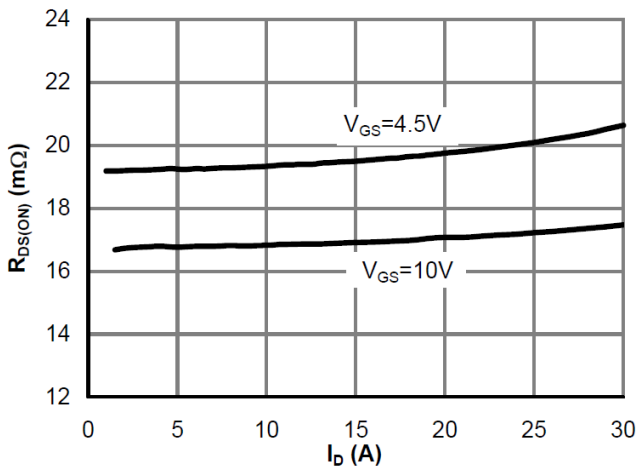


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

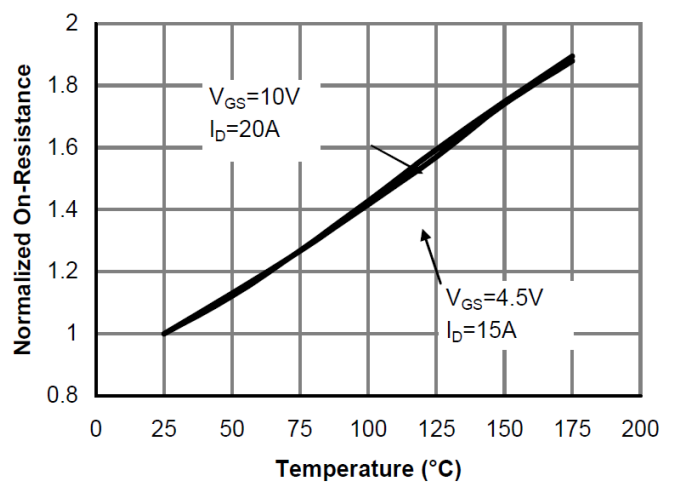


Figure 4: On-Resistance vs. Junction Temperature

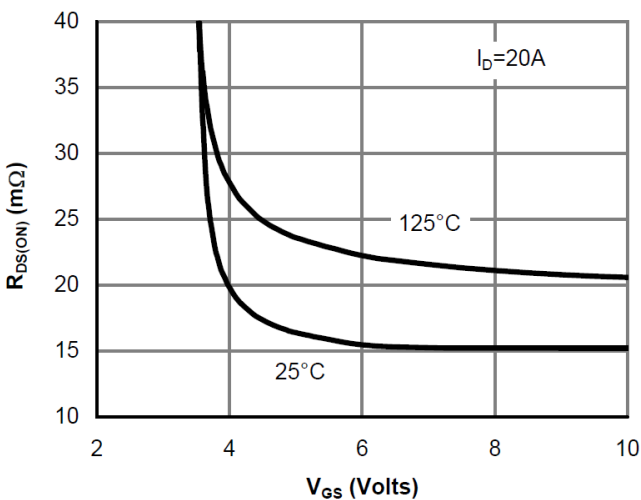


Figure 5: On-Resistance vs. Gate-Source Voltage

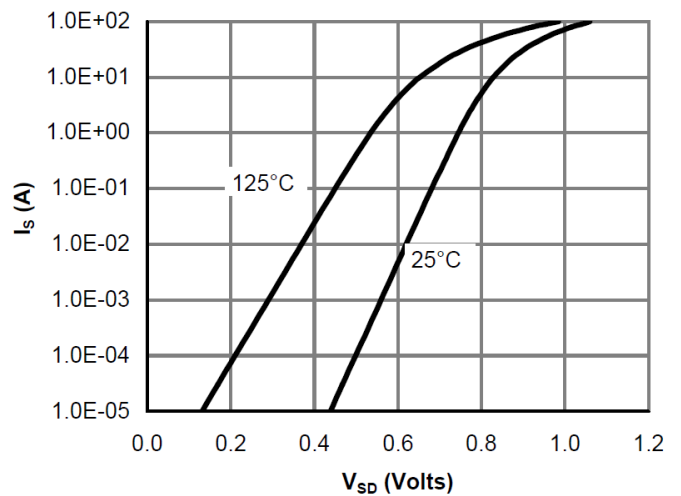


Figure 6: Body-Diode Characteristics

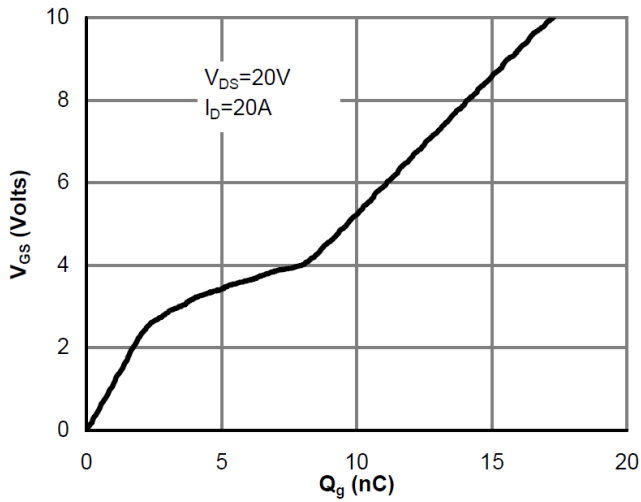


Figure 7: Gate-Charge Characteristics

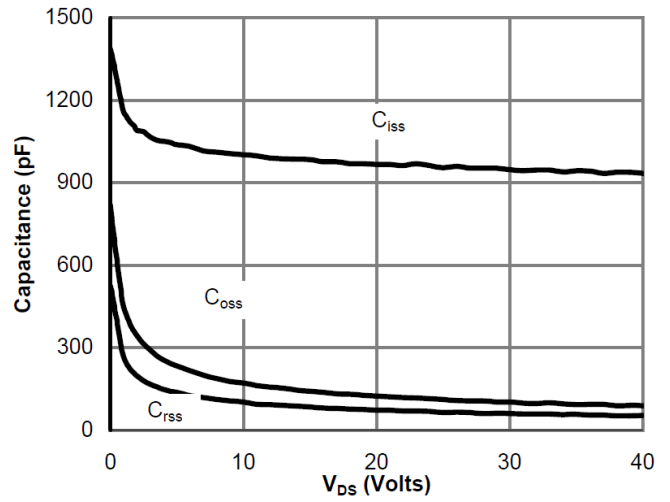


Figure 8: Capacitance Characteristics

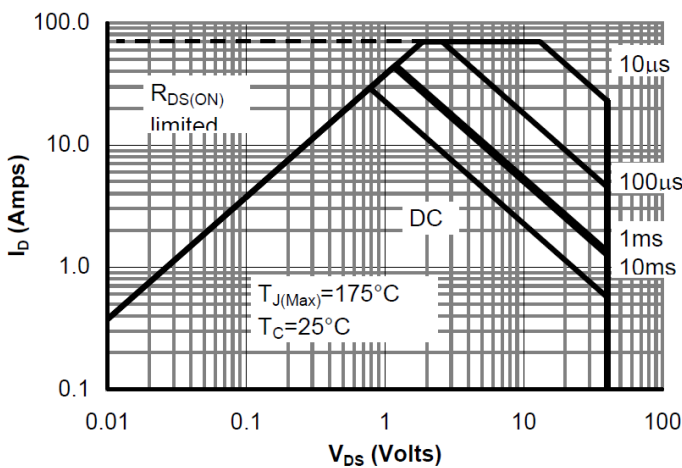


Figure 9: Maximum Forward Biased Safe Operating Area

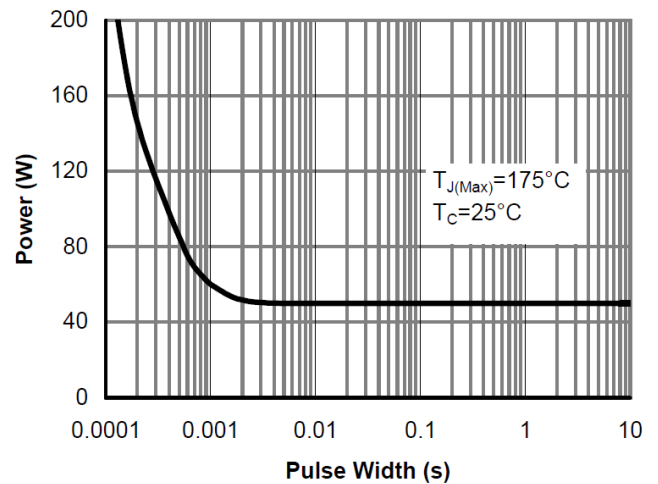


Figure 10: Single Pulse Power Rating Junction-to-Case

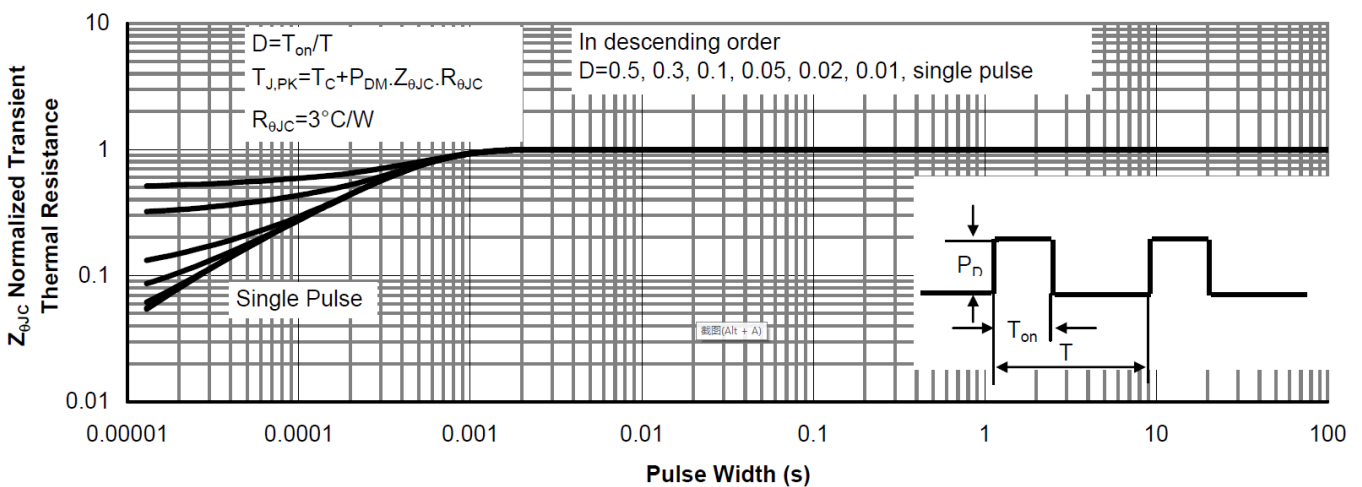
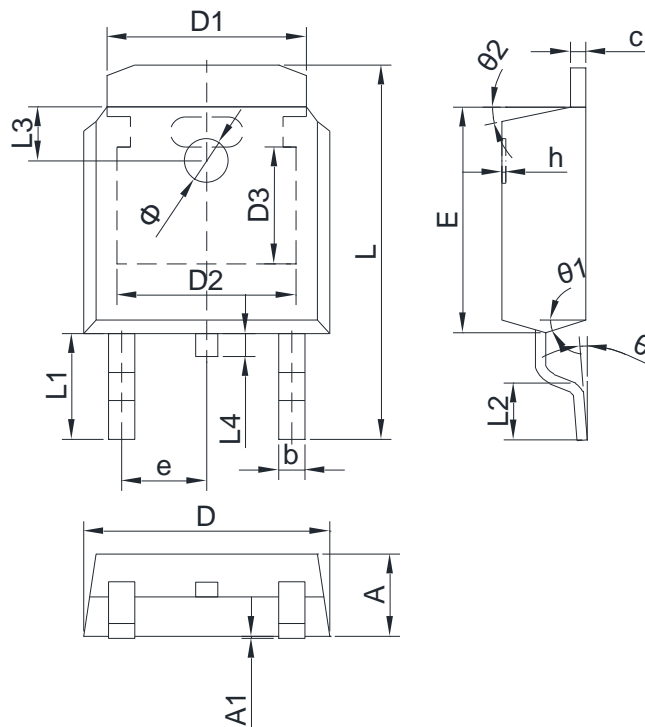


Figure 11: Normalized Maximum Transient Thermal Impedance

8. Dimension (TO-252)



SYMBOL	MILLIMETER			SYMBOL	MILLIMETER		
	MIN	Typ.	MAX		MIN	Typ.	MAX
A	2.200	2.300	2.400	h	0.000	0.100	0.200
A1	0.000		0.127	L	9.900	10.100	10.300
b	0.640	0.690	0.740	L1	2.888 REF		
C(电镀后)	0.460	0.520	0.580	L2	1.400	1.550	1.700
D	6.500	6.600	6.700	L3	1.600 REF		
D1	5.334 REF			L4	0.600	0.800	1.000
D2	4.826 REF			Φ	1.100	1.200	1.300
D3	3.166 REF			θ	0°		8°
E	6.000	6.100	6.200	θ1	9° TYP		
e	2.286 TYP			θ2	9° TYP		

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