SuperMOS – SOP8 -30V BV_{DSS}, 9.5mΩ $R_{DS(ON)}$, P-channel MOSFET

1. Description

The ES4407 is P-Channel enhancement MOS Field Effect Transistor. Uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. Device is suitable for use in DC-DC conversion, power switch and charging circuit. Standard Product ES4407 is Pb-free.

2. Features

- -30V, $R_{DS(ON)}$=9.5mΩ(Typ.) @V_{GS}=-10V
  $R_{DS(ON)}$=14mΩ(Typ.) @V_{GS}=-4.5V
- Fast Switching
- High density cell design for low $R_{DS(on)}$
- 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 Sizes
ES4407	SOP8	ES4407/lot	Halogen free	Tape & Reel	3,000 PCS	UL 94V-0	13 inches

Table-1 Ordering information

5. Pin Configuration and Functions

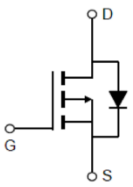
Pin	Function	Outline	Circuit Diagram
4	Gate	Note d 	
1/2/3	Source		
5/6/7/8	Drain		

Table-2 Pin configuration

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6. Specification

Absolute Maximum Rating & Thermal Characteristics

Ratings at 25 ℃ ambient temperature unless otherwise specified.

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		BV_{DSS}	-30	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current [a]	T_A=25°C	I_D	-12	A
	T_A=100°C		-10	
Maximum Power Dissipation [a]	T_A=25°C	P_D	3.1	W
	T_A=100°C		2.0	
Pulsed Drain Current [b]		I_{DM}	-60	A
Avalanche Current, Single Pulsed [c]		I_{AS}	-22	A
Avalanche Energy, Single Pulsed [c]		E_{AS}	72	mJ
Operating Junction Temperature		T_J	150	°C
Storage Temperature Range		T_{stg}	-55 to +150	°C

Thermal resistance ratings

Single Operation					
Parameter		Symbol	Typical	Maximum	Unit
Junction-to-Ambient Thermal Resistance [a]	t ≤ 10 s	$R_{\theta JA}$	32	40	°C/W
Junction-to-Case Thermal Resistance	Steady State	$R_{\theta JC}$	17	24	

Note:

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

b: Repetitive rating, pulse width limited by junction temperature, tp=10μs, Duty Cycle=1%

c: EAS condition：Tj=25℃,V_{DD}=-30V,V_G=-10V,L=0.3mH,Rg=25Ω

d: This diagram is only an electrical schematic, and the actual pin size is based on POD.

Electrical Characteristics

At TA = 25℃ unless otherwise specified

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
OFF CHARACTERISTICS						
Drain-to-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V, I_D=-250uA	-30			V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=-30V, V_{GS}=0V			-1	uA
Gate-to-source Leakage Current	I_{GSS}	V_{DS}=0V, V_{GS}=±20V			±100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS}=V_{DS}, I_D=-250uA	-1	-1.5	-2	V
Drain-to-source On-resistance	$R_{DS(on)}$	V_{GS}=-10V, I_D=-12A		9.5	13	mΩ
		V_{GS}=-4.5V, I_D=-7A		14	17	
Forward Trans conductance	g_{FS}	V_{DS}=-5.0V, I_D=-10A			40	S
CHARGES, CAPACITANCES AND GATE RESISTANCE						
Input Capacitance	C_{ISS}	V_{GS}=0V, f=1MHz, V_{DS} =-15V		1780		pF
Output Capacitance	C_{OSS}			235		
Reverse Transfer Capacitance	C_{RSS}			200		
Gate Resistance	R_g	f=1MHZ		6.0		Ω
Total Gate Charge	$Q_{G(TOT)}$	V_{GS}=-10V, V_{DS}=-15V, I_D=-15A		46		nC
Gate-to-Source Charge	Q_{GS}			1.0		
Gate-to-Drain Charge	Q_{GD}			1.4		
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	$t_{d(ON)}$	V_{GS}=-10V, V_{DS}=-15V, R_L=1Ω, R_G=3Ω		8		ns
Rise Time	t_r			27		
Turn-Off Delay Time	$t_{d(OFF)}$			68		
Fall Time	t_f			39		
BODY DIODE CHARACTERISTICS						
Forward Voltage	V_{SD}	V_{GS}=0V, I_S=-1.0A		-0.7	-1	V

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7. Typical Characteristic

Figure 1. On-Regin Characteristics

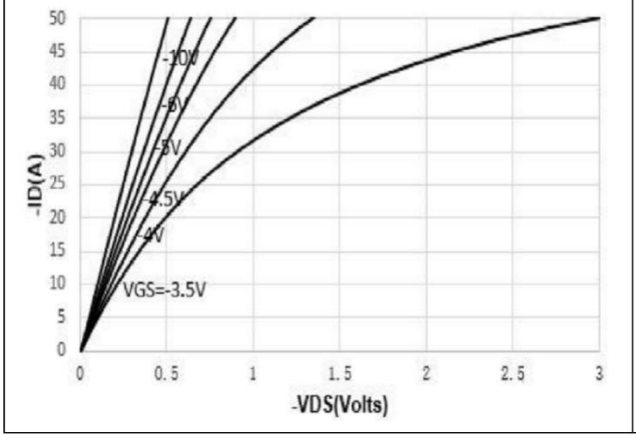


Figure 2. Transfer Characteristics

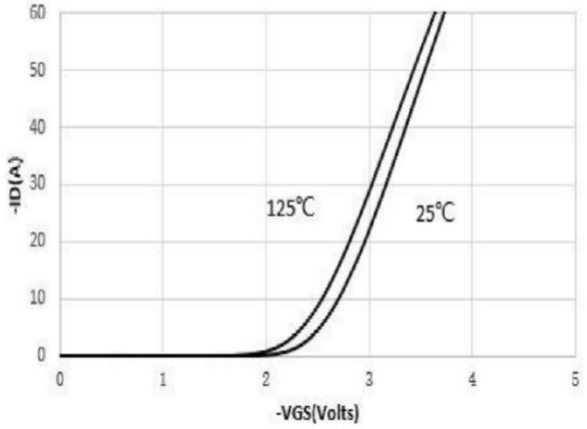


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

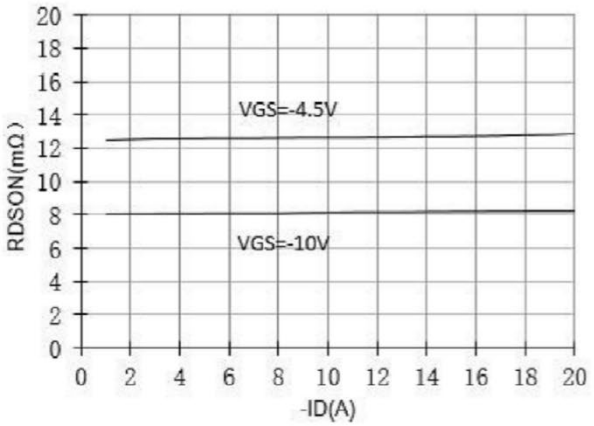


Figure 4. On-Resistance vs. Junction Temperature

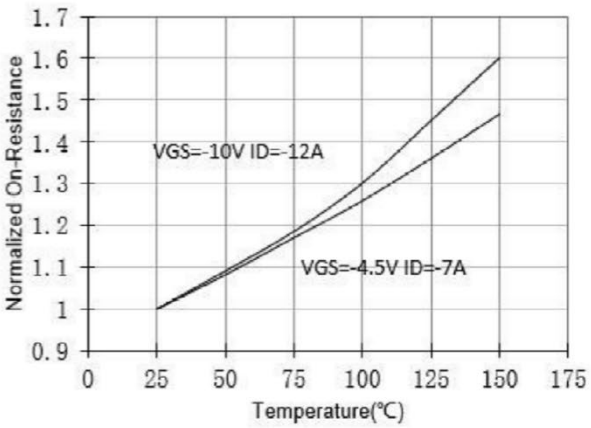


Figure 5. On-Resistance vs. Gate-Source Voltage

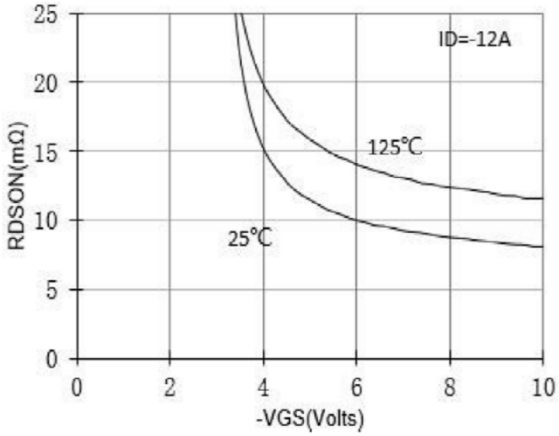


Figure 6. Body-Diode Characteristics

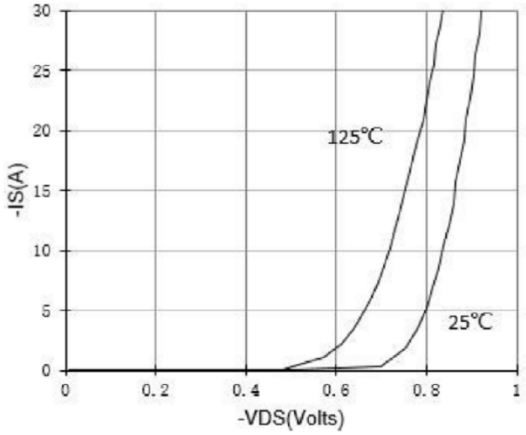
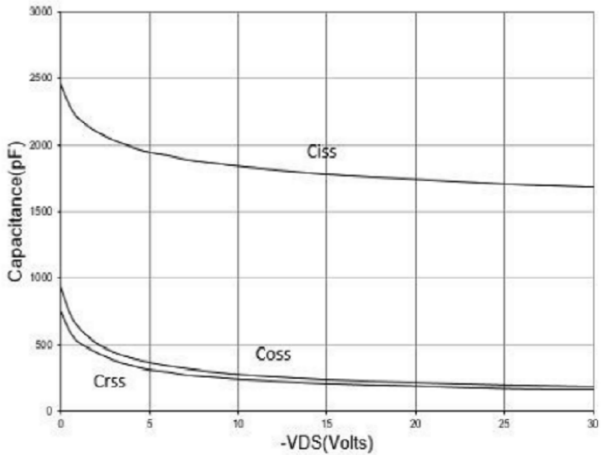
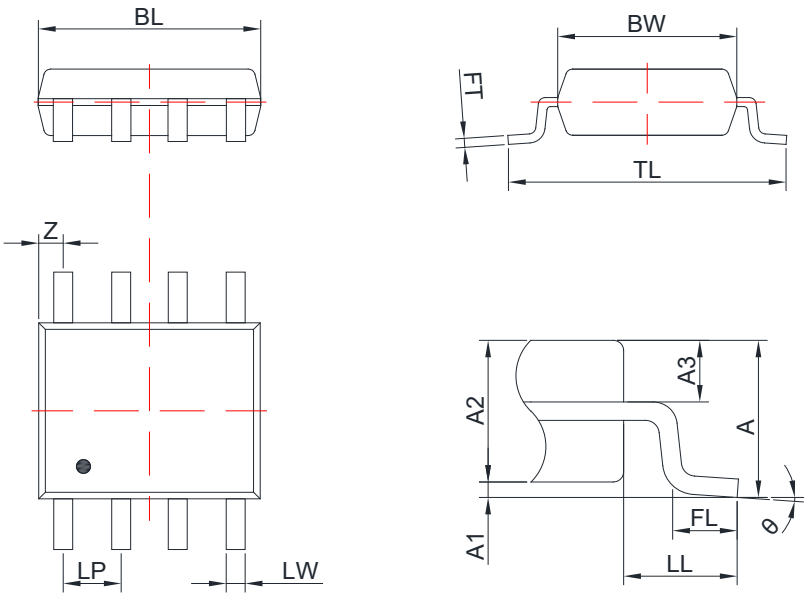


Figure 7. Capacitance Characteristics



8. Dimension (SOP8)

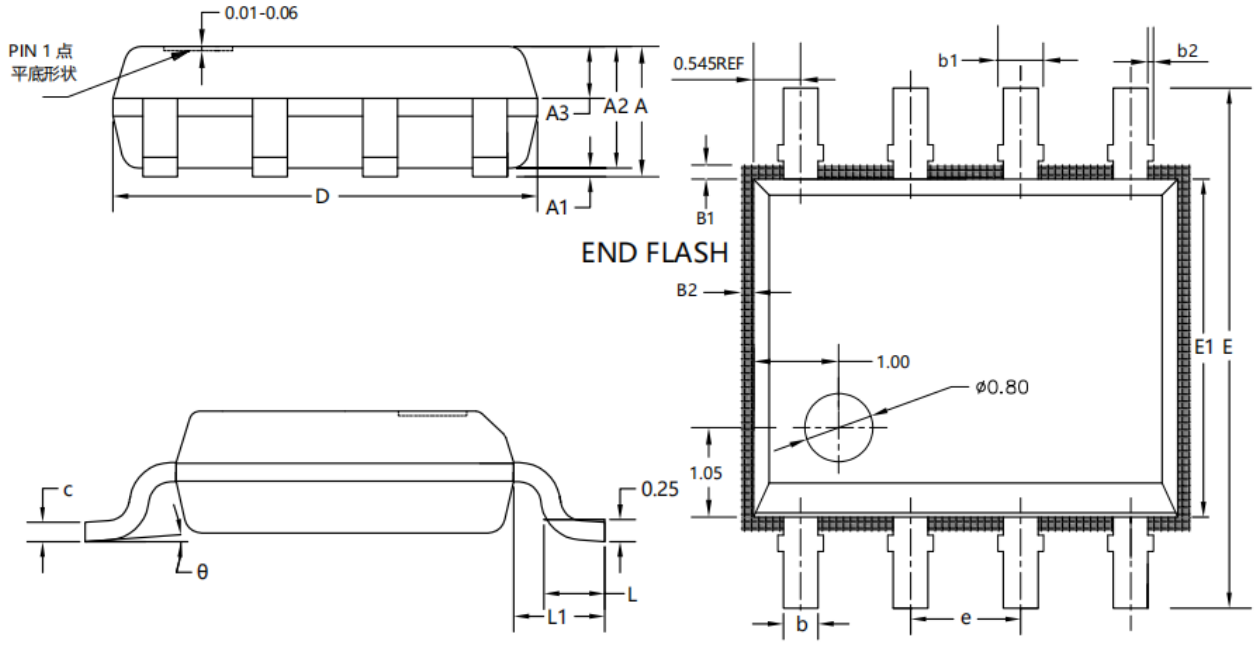
POD A(Y)



COMMON DIMENSIONS: UNITS OF MEASURE=MILLIMETER

Symbol	Dimensions		Symbol	Dimensions	
	Min.	Max.		Min.	Max.
A	1.75		FL	0.50	0.80
A1	0.05	0.15	LP	1.25	1.30
A2	1.40	1.50	LL	1.1 BSC	
A3	0.623 BSC		LW	0.38	0.43
BL	4.92	5.08	TL	5.90	6.10
BW	3.70	4.10	Z	0.54	
FT	0.20	0.21	θ	0°	8°

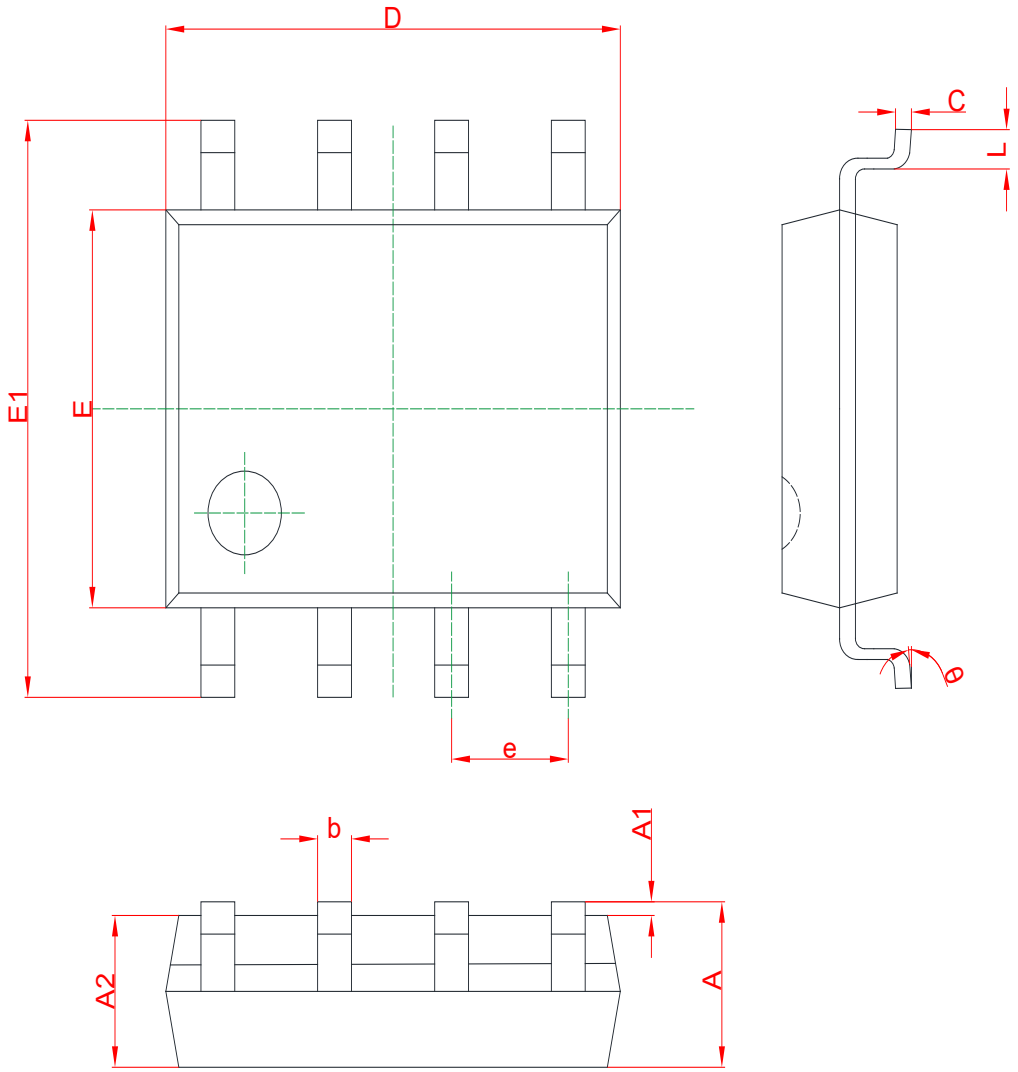
POD B(C)



COMMON DIMENSIONS: UNITS OF MEASURE=MILLIMETER

Symbol	Dimensions			Symbol	Dimensions		
	Min.	NOM.	Max.		Min.	NOM.	Max.
A	1.55	1.65	1.75	L	0.50	0.60	0.70
A1	0.06	0.11	0.16	L1	0.90	1.05	1.20
A2	1.35	1.45	1.55	θ	0°	4°	8°
A3	0.60	0.70	0.80	B1	0.14MAX		
b	0.30	0.40	0.50	B2	0.12MAX		
c	0.17	0.20	0.25	b1	0.66MAX		
D	4.80	4.90	5.00	b2	0	0.04	0.08
E	5.80	6.00	6.20	e	1.27BSC		
E1	3.80	3.90	4.00				

POD C(X)



Symbol	Dimensions		Symbol	Dimensions	
	Min.	Max.		Min.	Max.
L	0.40	0.60	e	1.27 TYP	
D	4.95	5.05	c	0.15	0.25
E	3.8	4.0	A2	1.33	1.50
E1	5.80	6.20	A1	0.04	0.20
b	0.4 TYP		θ	0°	8°

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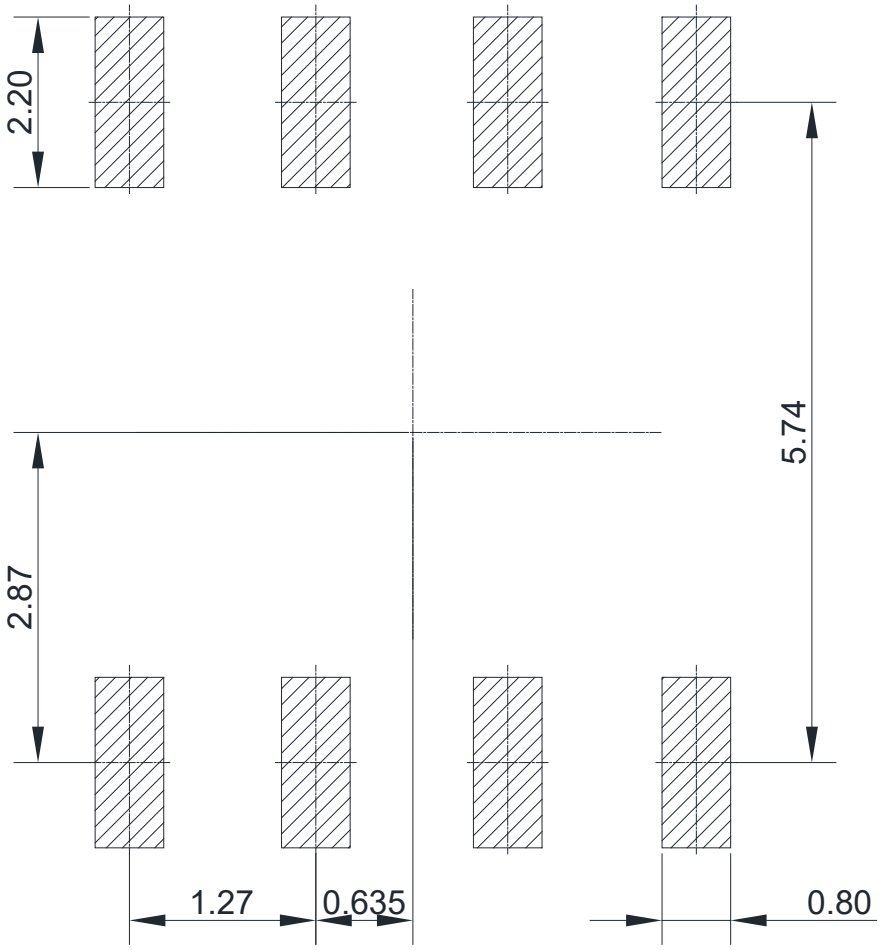
9. Recommended Soldering Footprint



DIMENSIONS: MILLIMETERS

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