

SuperMOS – TO-263 -60V BV_{DSS}, 27mΩ R_{DS(on)}, P-channel MOSFET

1. Description

The ESB409L 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 ESB409L is Pb-free.

2. Features

- -60V, R_{DS(on)}=27mΩ(TYP.) @V_{GS}=-10V
R_{DS(on)}=31mΩ(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 Size
ESB409L	TO-263	ESB409L/lot	Halogen free	Tape & Reel	800 PCS	UL 94V-0	13 inches

Table-1 Ordering information

5. Pin Configuration and Functions

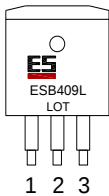
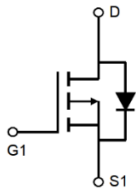
Pin	Function	Outline	Circuit Diagram
3	Source	Note b 	
1	Gate		
2	Drain		

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}	-60	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current	$T_C=25^{\circ}\text{C}$	I_D	-33	A
	$T_C=75^{\circ}\text{C}$		-26	
Maximum Power Dissipation	$T_C=25^{\circ}\text{C}$	P_D	69	W
	$T_C=75^{\circ}\text{C}$		42	
Pulsed Drain Current		I_{DM}	-132	A
Avalanche current single pulse ^a		I_{AS}	-29	A
Avalanche energy single pulse ^a		E_{AS}	136	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- Case Thermal Resistance($t \leq 10s$)	$R_{\theta JC}$	1.5	1.8	°C/W

Note

a: $R_G=25\Omega$, $V_{DD}=-60V$, $V_{GS}=-10V$, $L=0.3mH$, $T_J=25^{\circ}\text{C}$

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

Electrical Characteristics

At TA = 25°C 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	-60			V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =-60V, 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	-1.6	-2.1	V
Drain-to-source On-resistance	R _{DS(on)}	V _{GS} =-10V, I _D =-20A		27	34	mΩ
		V _{GS} =-4.5V, I _D =-20A		31	38	
Forward Transconductance	g _{FS}	V _{DS} =-5V, I _D =-20A			60	S
CHARGES, CAPACITANCES AND GATE RESISTANCE						
Input Capacitance	C _{ISS}	V _{GS} =0V V _{DS} =-20V f=1MHz		3020		pF
Output Capacitance	C _{OSS}			180		
Reverse Transfer Capacitance	C _{RSS}			160		
Total Gate Charge	Q _{G(TOT)}	V _{GS} =-10V V _{DS} =-20V I _D =-10A		46.6		nC
Gate-to-Source Charge	Q _{GS}			9.1		
Gate-to-Drain Charge	Q _{GD}			6.2		
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	t _{d(ON)}	V _{GS} =-10V, V _{DS} =-15V, ID=-1A, R _G =3Ω		45		ns
Rise Time	t _r			28		
Turn-Off Delay Time	t _{d(OFF)}			80		
Fall Time	t _f			6.6		
BODY DIODE CHARACTERISTICS						
Forward Voltage	V _{SD}	V _{GS} =0V, I _S =-1.0A			-1.5	V

7. Typical Characteristic

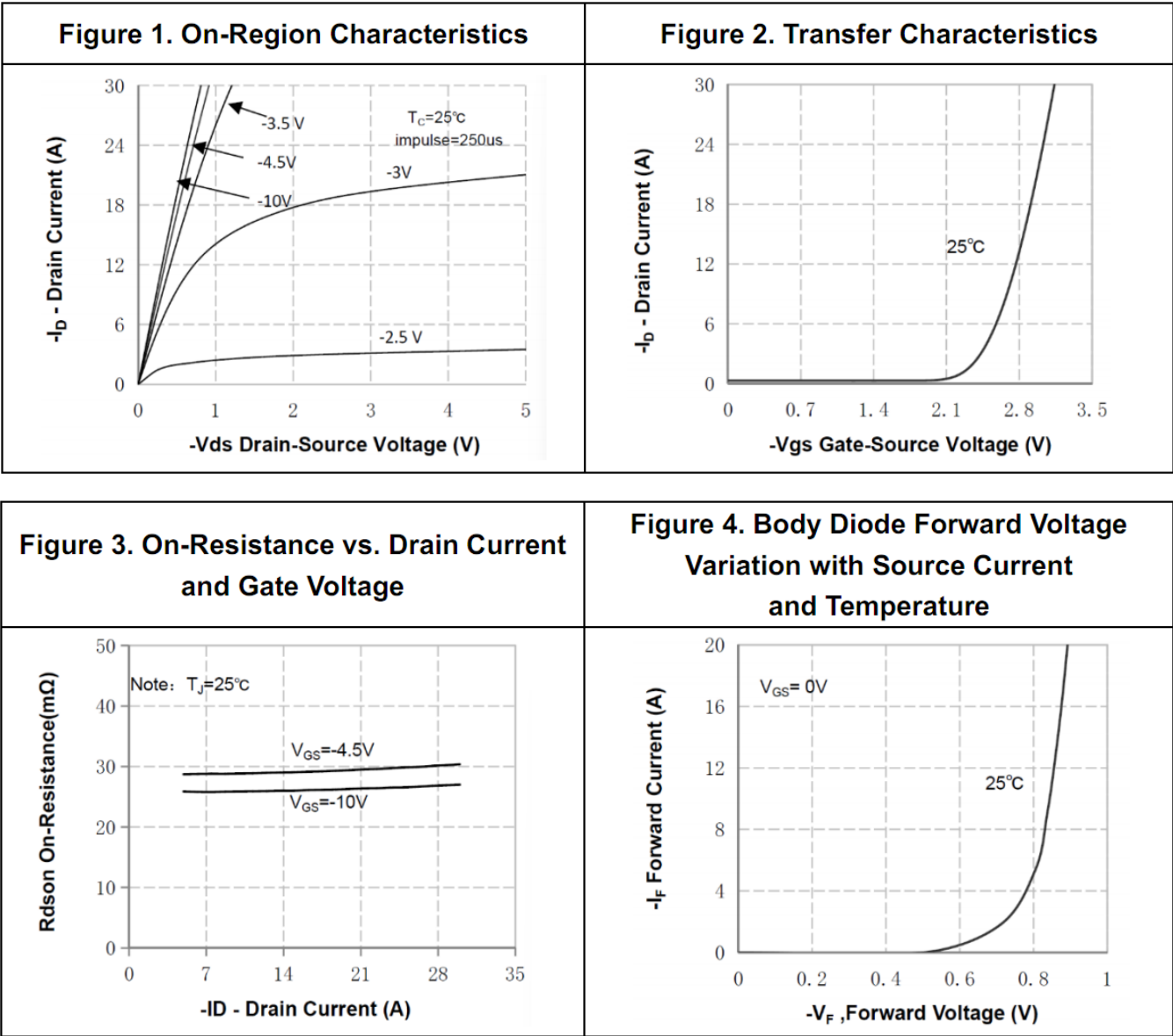


Figure 5. On-Resistance vs. Gate-Source Voltage

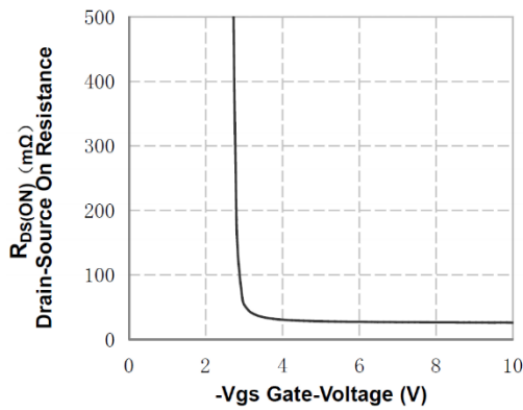


Figure 6. Capacitance Characteristics

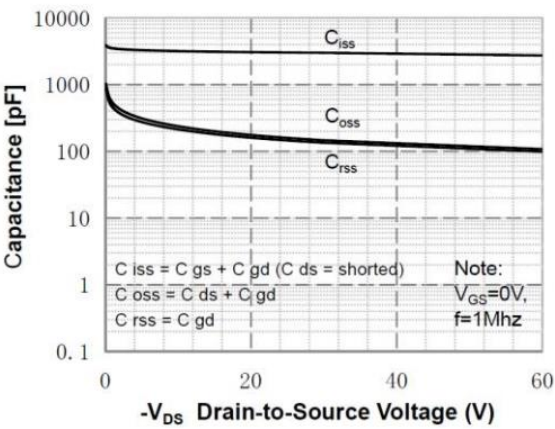
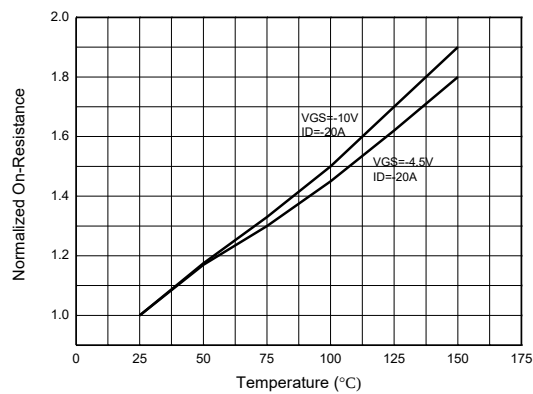
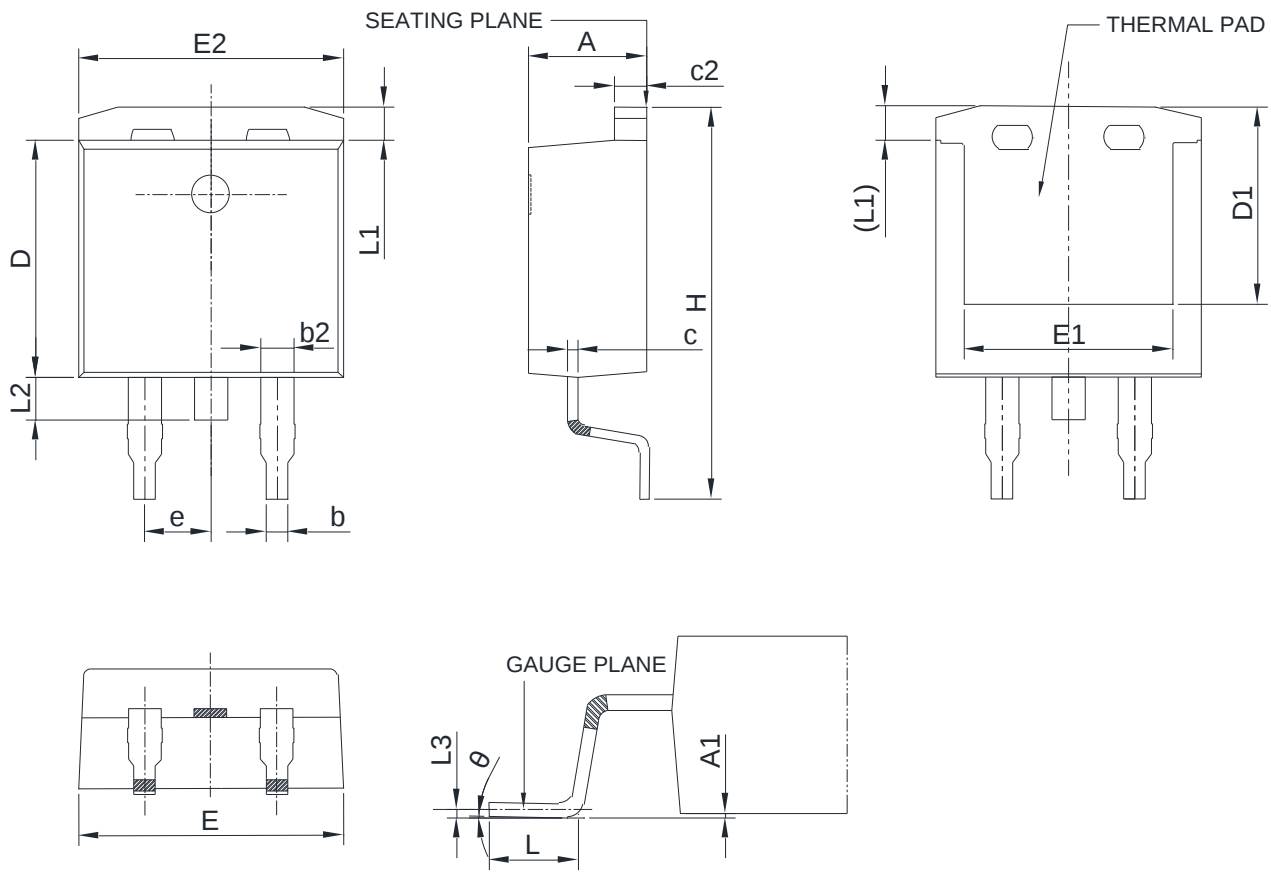


Figure 7. Normalized On-Resistance vs Temperature



8. Dimension (TO-263)

POD A(Q)

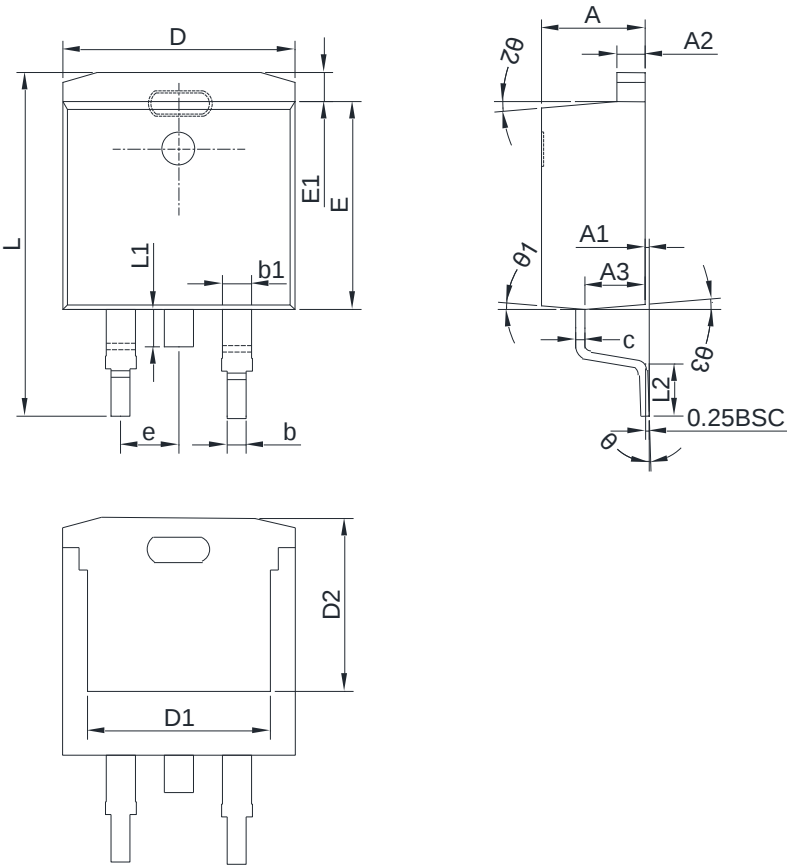


COMMON DIMENSIONS CUNITS MEASURE=MILLIMETER							
SYMBOL	MIN	TYP	MAX	SYMBOL	MIN	TYP	MAX
A	4.47	4.57	4.67	E	9.70	9.92	10.30
A1	0.00	0.10	0.25	E1	7.98	8.18	8.48
b	0.71	0.81	0.91	E2	9.85	10.00	10.15
b2	1.17	1.27	1.37	L	2.25	2.54	2.80
c	0.360	0.381	0.500	L1	1.10	1.35	1.60
c2	1.17	1.27	1.37	L2			1.78
D	8.70	9.00	9.30	L3	0.254BSC		
D1	7.10	7.44	7.80	e	2.44	2.54	2.64
H	15.00	15.28	15.60	θ	0°		8°

ESB409L

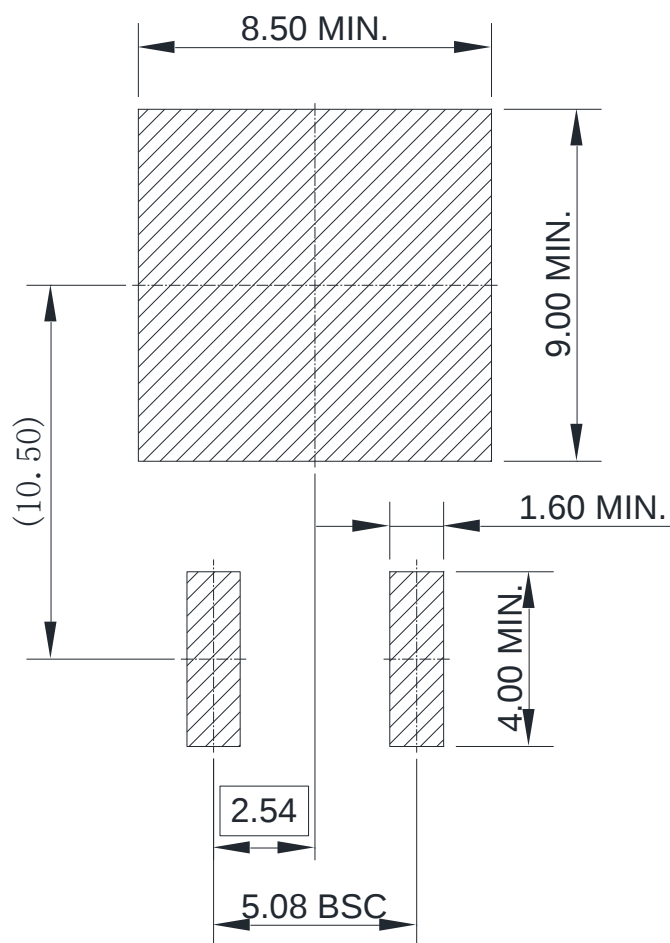
Rev-1.4

POD B(X)



COMMON DIMENSIONS CUNITS MEASURE=MILLIMETER							
SYMBOL	MIN	TYP	MAX	SYMBOL	MIN	TYP	MAX
A	4.37	4.57	4.77	E	8.50	8.70	8.90
A1	0.00		0.25	E1	1.07	1.27	1.47
A2	1.22	1.27	1.42	e	2.540TYP		
A3	2.49	2.69	2.89	L	14.70	15.10	15.50
b	0.70	0.81	0.96	L1	1.40	1.55	1.70
b1	1.17	1.27	1.47	L2	2.00	2.30	2.60
c	0.30	0.38	0.53	θ	0°		9°
D	9.86	10.16	10.36	θ_1	7° TYP		
D1	8.400REF			θ_2	7° TYP		
D2	7.073REF			θ_3	3° TYP		

9. Recommended Soldering Footprint



DIMENSIONS: MILLIMETERS

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