

SuperMOS – TO-252 -60V BV_{DSS}, 27mΩ R_{DS(on)}, P-channel MOSFET

1. Description

The ESD409 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 ESD409 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 sizes
ESD409	TO-252	ESD409/lot	Halogen free	Tape & Reel	2,500 PCS	UL 94V-0	13 inches

Table-1 Ordering information

5. Pin Configuration and Functions

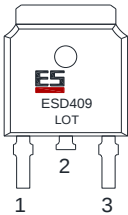
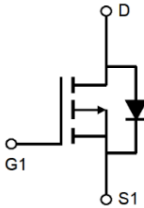
Pin	Function	Outline	Circuit Diagram
3	Source	Note b 	
1	Gate		
2	Drain		

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	-28	A
	$T_C=75^{\circ}\text{C}$		-22	
Maximum Power Dissipation	$T_C=25^{\circ}\text{C}$	P_D	50	W
	$T_C=75^{\circ}\text{C}$		30	
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	$^{\circ}\text{C}$
Storage Temperature Range		T_{stg}	-55 to +150	$^{\circ}\text{C}$

Thermal resistance ratings

Single Operation				
Parameter	Symbol	Typical	Maximum	Unit
Junction-to- Case Thermal Resistance($t \leq 10\text{s}$)	$R_{\theta JC}$	1.9	2.5	$^{\circ}\text{C/W}$

Note

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

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, I _D =-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

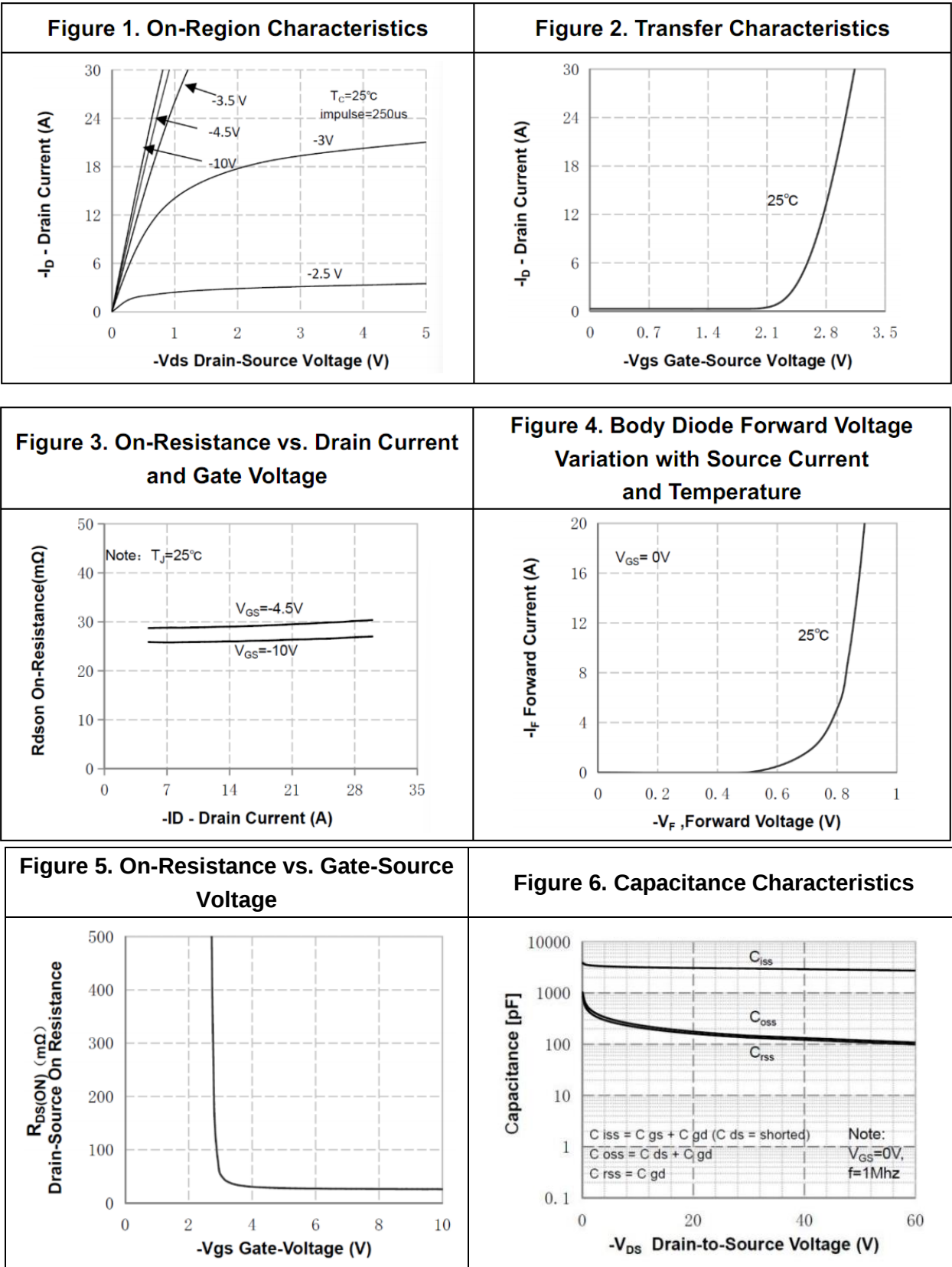
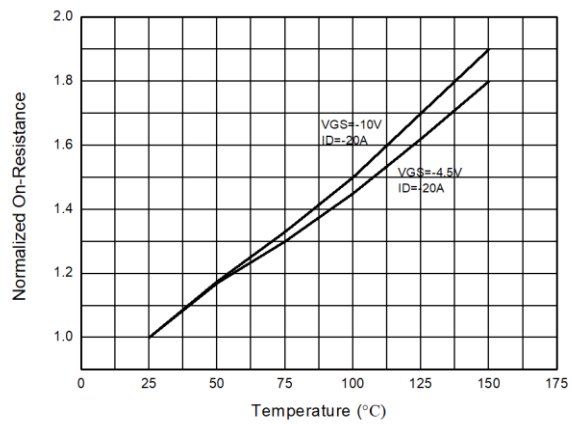
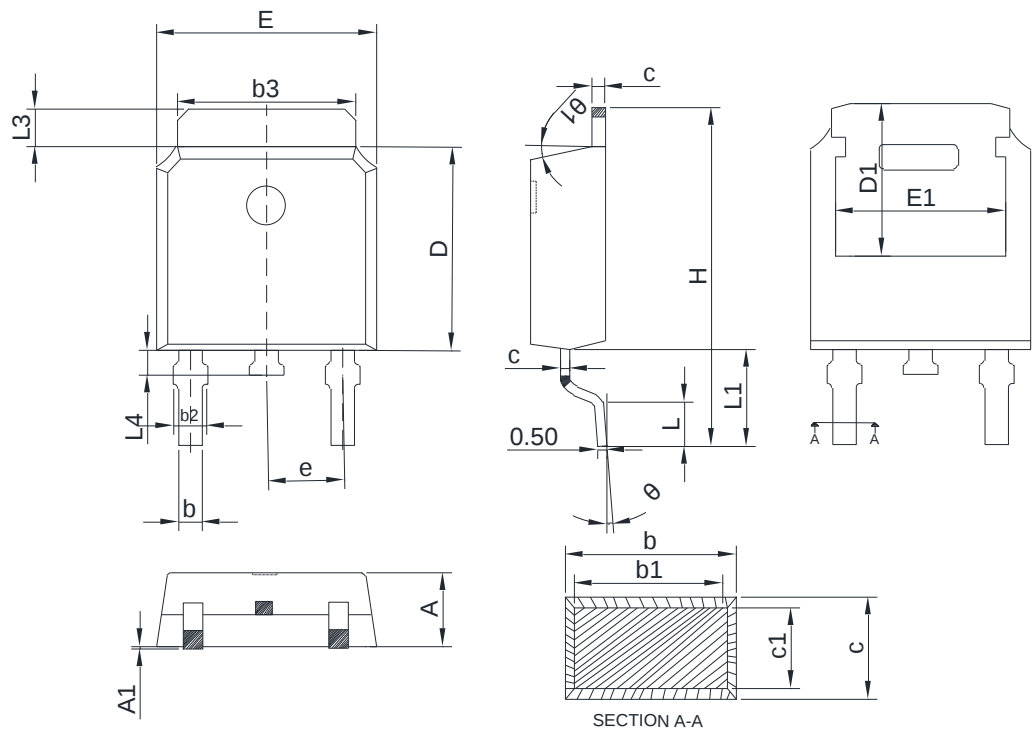


Figure 7. Normalized On-Resistance vs Temperature



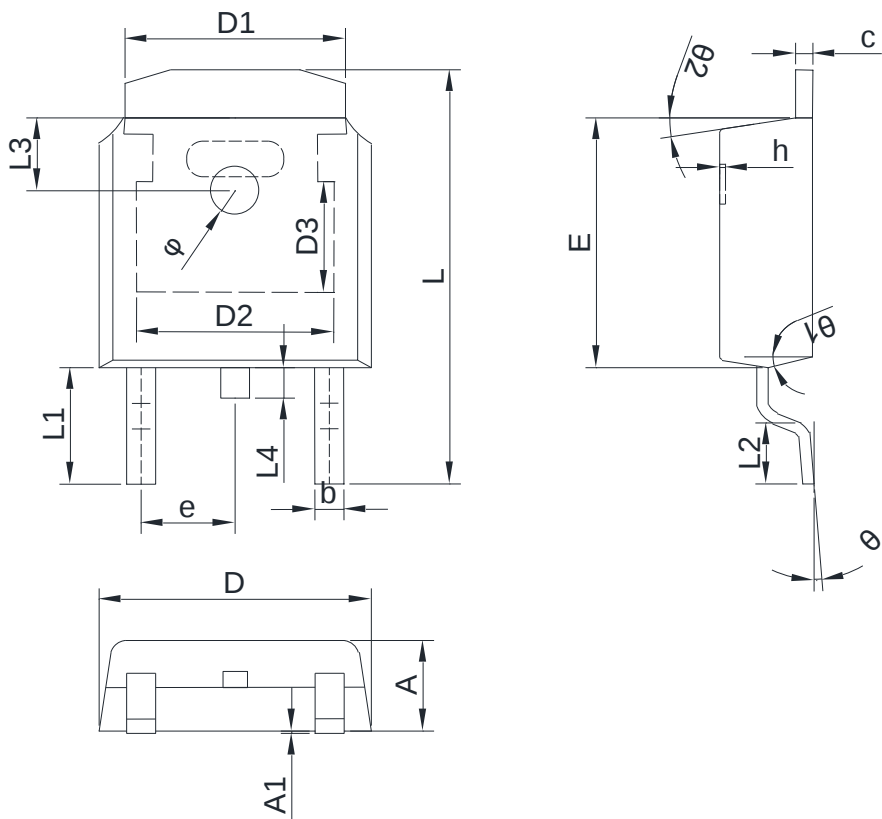
8. Dimension (TO-252)

POD A(Q)



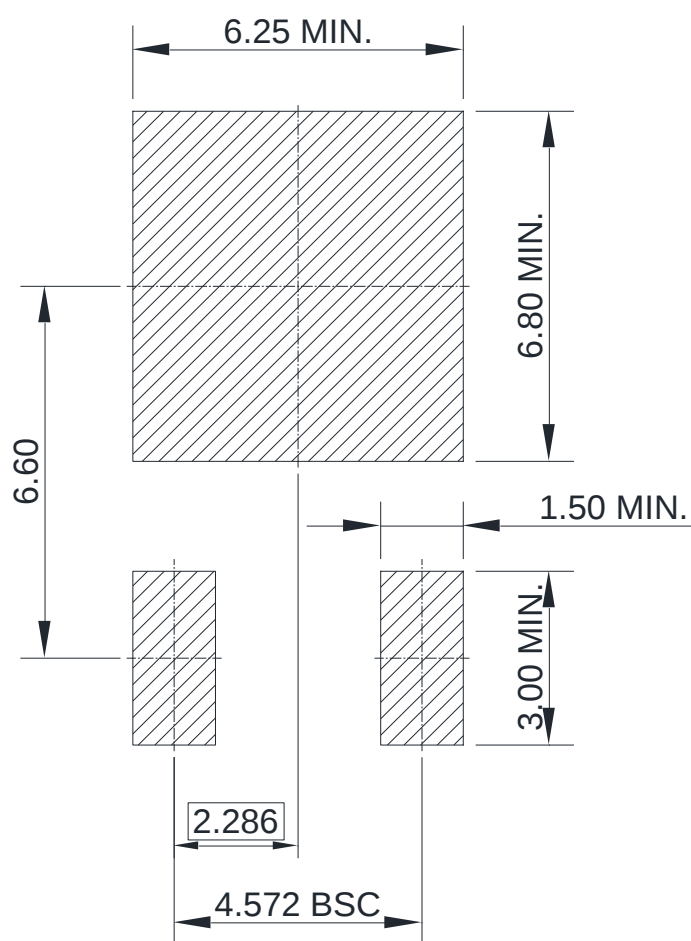
COMMON DIMENSIONS CUNITS MEASURE=MILLIMETER							
SYMBOL	MIN	TYP	MAX	SYMBOL	MIN	TYP	MAX
A	2.20	2.30	2.40	D1	5.21	-	-
A1	0.00	-	0.12	E	6.50	6.60	6.70
b	0.65	-	0.89	E1	4.32	-	-
b1	0.64	0.76	0.79	H	9.70	9.95	10.20
b2	0.76	0.86	1.10	L	1.40	1.50	1.60
b3	5.20	5.33	5.46	L1	2.84REF		
c	0.48	-	0.60	e	2.29BSC		
c1	0.47	0.51	0.55	θ	0°	-	10°
D	6.00	6.10	6.20	θ1	0°	-	15°
L3	0.90	-	1.27	L4	0.60	0.80	1.00

POD B(X)



COMMON DIMENSIONS CUNITS MEASURE=MILLIMETER							
SYMBOL	MIN	TYP	MAX	SYMBOL	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		

9. Recommended Soldering Footprint



DIMENSIONS: MILLIMETERS

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