

SuperMOS – TO-220F -60V BV_{DSS}, 27mΩ R_{DS(on)}, P-channel MOSFET

1. Description

The ESTF409 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 ESTF409 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 Tube	Flammability Rating
ESTF409	TO-220F	ESTF409/lot	Halogen free	Tube	50 PCS	UL 94V-0

Table-1 Ordering information

5. Pin Configuration and Functions

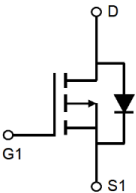
Pin	Function	Outline	Circuit Diagram
3	Source	Note 1 	
1	Gate		
2	Drain		

Table-2 Pin configuration

Note1:

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

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	$T_A=25^{\circ}\text{C}$	I_D	-12.7	A
	$T_A=75^{\circ}\text{C}$		-10	
Maximum Power Dissipation	$T_A=25^{\circ}\text{C}$	P_D	8.3	W
	$T_A=75^{\circ}\text{C}$		5	
Pulsed Drain Current		I_{DM}	-96	A
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($t \leq 10\text{s}$)	$R_{\theta JA}$	12	15	°C/W

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			-1.2	V

7. Typical Characteristic

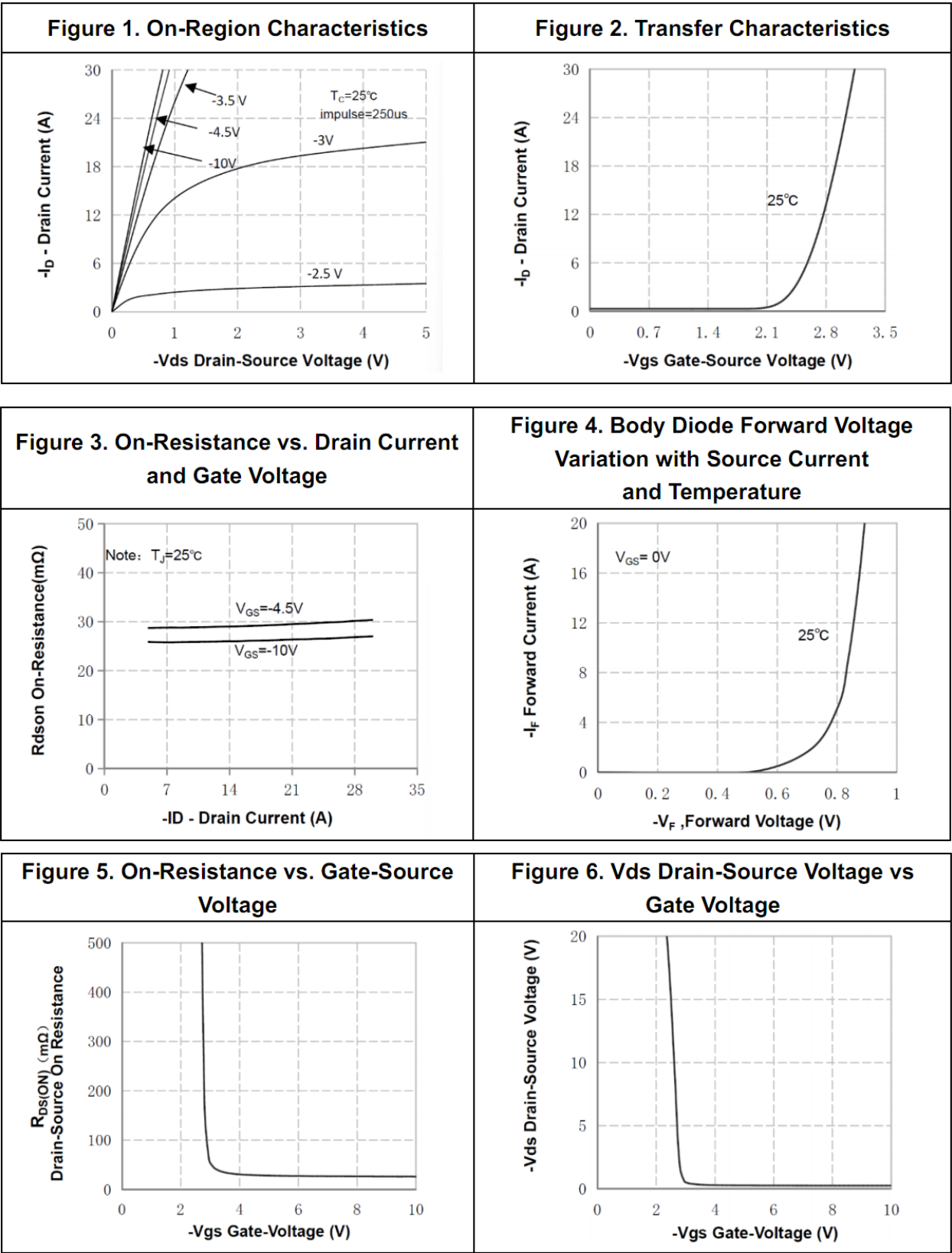
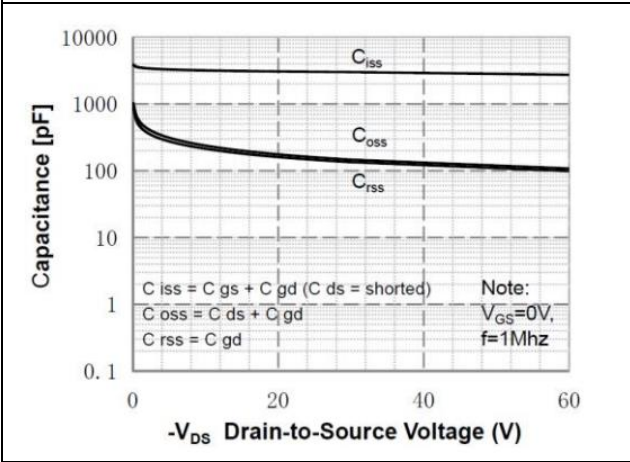
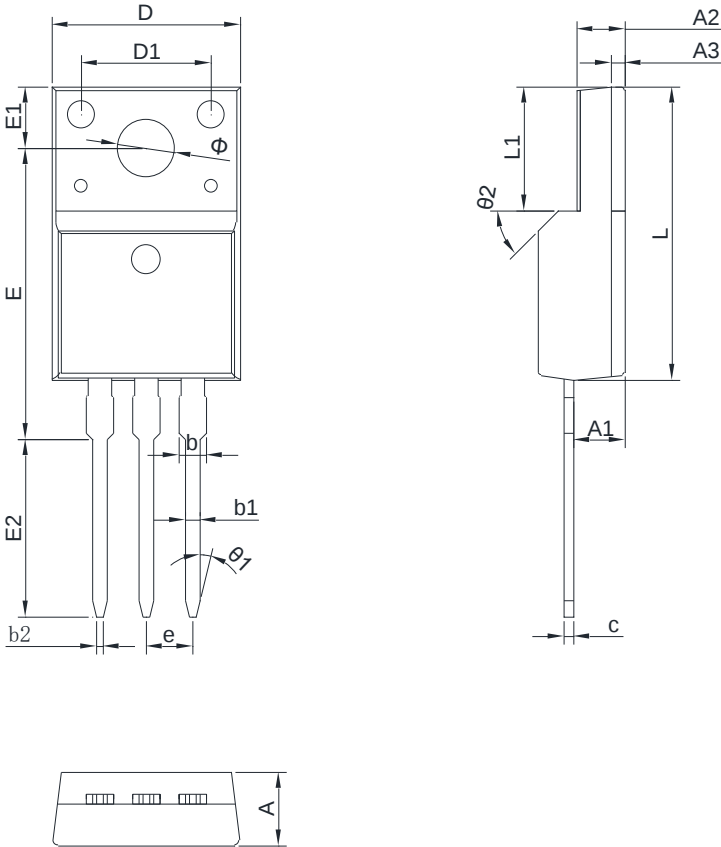


Figure 7. Capacitance Characteristics



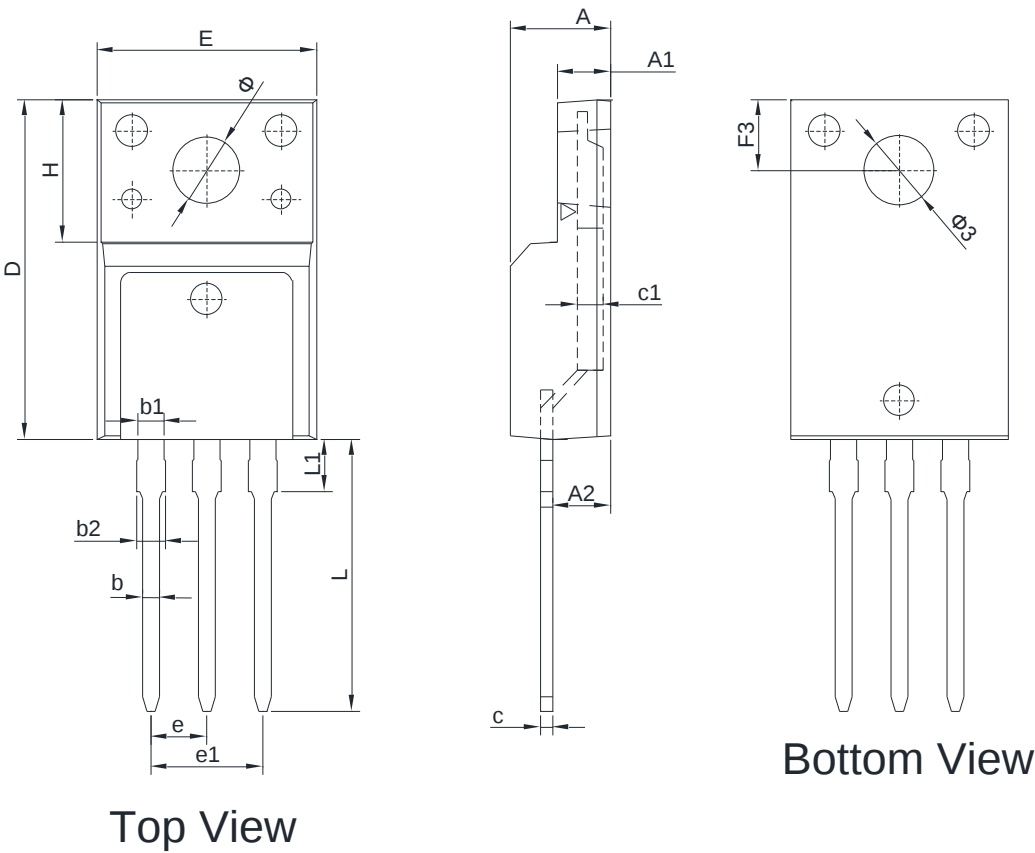
8. Dimension (TO-220F)

POD A(D)



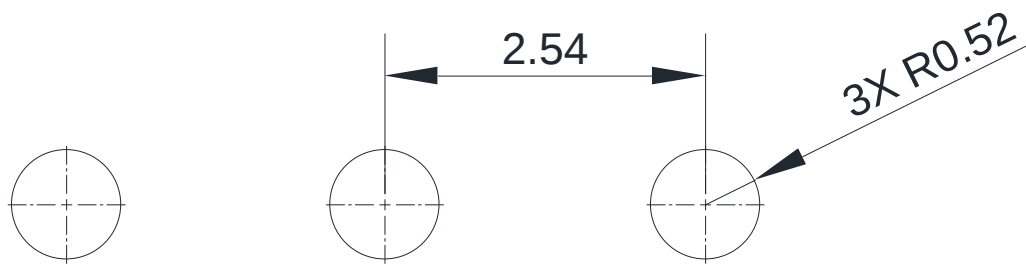
REF	Millimeters		REF	Millimeters	
	Min	Max		Min	Max
A	4.50	4.90	E	15.6	16.00
A1	2.56	2.96	E1	3.20	3.40
A2	2.34	2.74	E2	9.45	10.05
A3	0.70 REF		e	2.54 REF	
b		1.45	L	15.67	16.07
b1	0.70	0.90	L1	6.48	6.88
b2	0.25	0.45	Φ	3.10	3.30
c	0.45	0.60	θ 1	30° REF	
D	10.06	10.26	θ 2	45° REF	
D1	7.0 REF				

POD B(X)



COMMON DIMENSIONS CUNITS MEASURE=MILLIMETER							
SYMBOL	MIN	TYP	MAX	SYMBOL	MIN	TYP	MAX
A	4.50	4.70	4.90	H	6.70 REF		
A1	2.34	2.54	2.74	E	9.96	10.16	10.36
A2	2.56	2.76	2.96	e	2.54 BSC		
b	0.70	0.80	0.95	e1	5.08 BSC		
b1	1.18	1.28	1.43	L	12.68	12.98	13.28
b2	1.25	1.35	1.55	L1	2.78	2.93	3.08
c	0.40	0.50	0.65	F3	3.15	3.30	3.45
c1	1.20	1.30	1.35	Φ	3.03	3.18	3.45
D	15.57	15.87	16.17	$\Phi 3$	3.15	3.45	3.65

9. Recommendation of Hole Pattern



DIMENSIONS: MILLIMETERS

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