

IRF1404PBF(ES)

Rev-1.3

SuperMOS –TO-220 40V BV_{DSS} , $2m\Omega$ $R_{DS(ON)}$, N-channel MOSFET

1. Description

The IRF1404PBF(ES) is N-Channel enhancement MOS Field Effect Transistor. Uses advanced shielded gate 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 IRF1404PBF(ES) is Pb-free.

2. Features

- 40V, $R_{DS(ON)}=2m\Omega$ (Typ.) @ $V_{GS}=10V$
 $R_{DS(ON)}=3m\Omega$ (Typ.) @ $V_{GS}=4.5V$
- High density cell design for low $R_{DS(on)}$
- Material: Halogen free
- Reliable and rugged
- Avalanche Rated
- Low leakage current

3. Applications

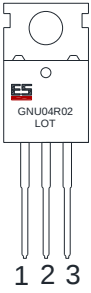
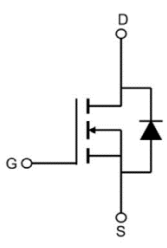
- PWM applications
- Load switch
- Power management in portable/desktop PCs
- DC/DC conversion

100% UIS TESTED

4. Ordering Information

Part Number	Package	Marking	Material	Packing	Quantity per Tube	Flammability Rating
IRF1404PBF(ES)	TO-220	GNU04R02/LOT	Halogen free	Tube	50 PCS	UL 94V-0

5. Pin Configuration and Functions

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

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}	40	V
Gate-Source Voltage		V_{GS}	± 20	V
Continuous Drain Current	$T_C=25^\circ\text{C}$	I_D	140	A
Maximum Power Dissipation		P_D	83	W
Pulsed Drain Current		I_{DM}	560	A
Single Pulse Avalanche Energy ^a		E_{AS}	200	mJ
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	$R_{\theta JC}$		1.5	°C/W

Notes:

- EAS condition: Starting $T_J=25^\circ\text{C}$, $V_{DD}=32\text{V}$, $V_G=10\text{V}$, $R_G=25\Omega$, $L=0.5\text{mH}$.
- This diagram is only an electrical schematic, and the actual pin size is based on POD.

IRF1404PBF(ES)

Rev-1.3

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	40			V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =40V, V _{GS} =0V			1.0	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	1.0		2.5	V
Drain-to-source On-resistance	R _{DS(on)}	V _{GS} =10V, I _D =20A		2.0	2.3	mΩ
		V _{GS} =4.5V, I _D =20A		3.0	3.8	
CHARGES, CAPACITANCES AND GATE RESISTANCE						
Input Capacitance	C _{ISS}	V _{GS} =0V, f=1MHz, V _{DS} =25V		3830		pF
Output Capacitance	C _{OSS}			2800		
Reverse Transfer Capacitance	C _{RSS}			480		
Total Gate Charge	Q _{G(TOT)}	V _{GS} =10V, V _{DD} =32V, I _D =10A		66		nC
Gate-to-Source Charge	Q _{GS}			13.6		
Gate-to-Drain Charge	Q _{GD}			12.6		
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	t _{d(ON)}	V _{GS} =10V, V _{DD} =20V, I _D =20A, R _G =0.5Ω		890		ns
Rise Time	t _r			21		
Turn-Off Delay Time	t _{d(OFF)}			72		
Fall Time	t _f			34		
BODY DIODE CHARACTERISTICS						
Forward Voltage	V _{SD}	V _{GS} =0V, I _S =20A			1.5	V

7. Typical Characteristics

Figure1: Output Characteristics

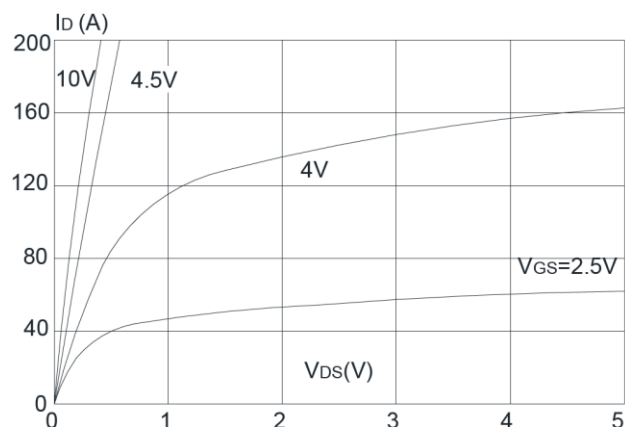


Figure 2: Typical Transfer Characteristics

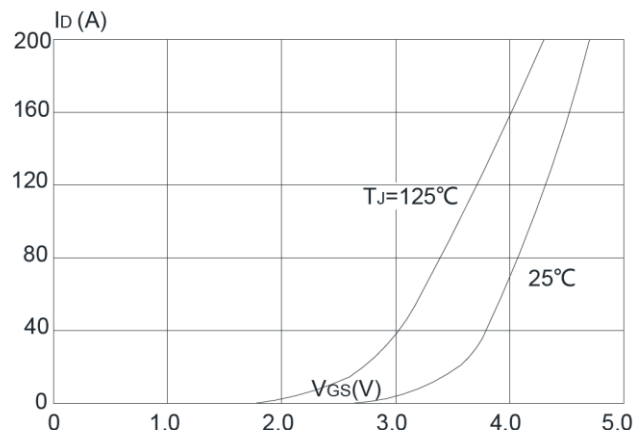


Figure 3: On-resistance vs. Drain Current

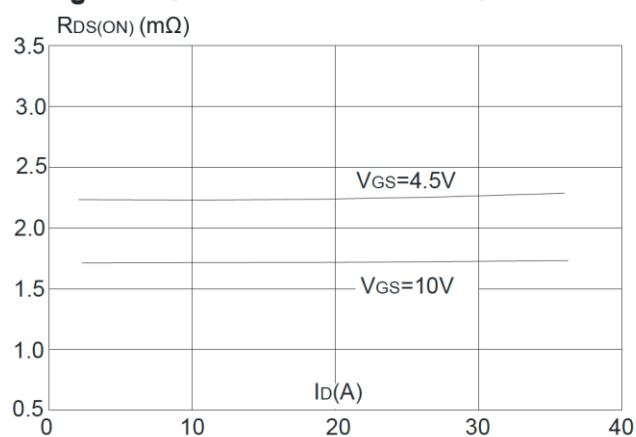


Figure 4: Body Diode Characteristics

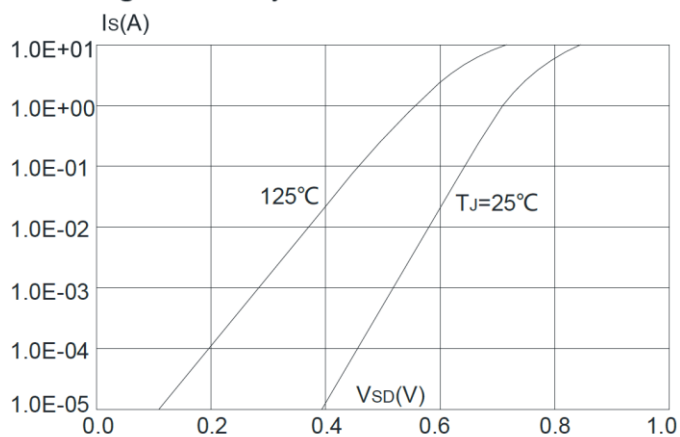


Figure 5: Normalized on Resistance vs. Junction Temperature

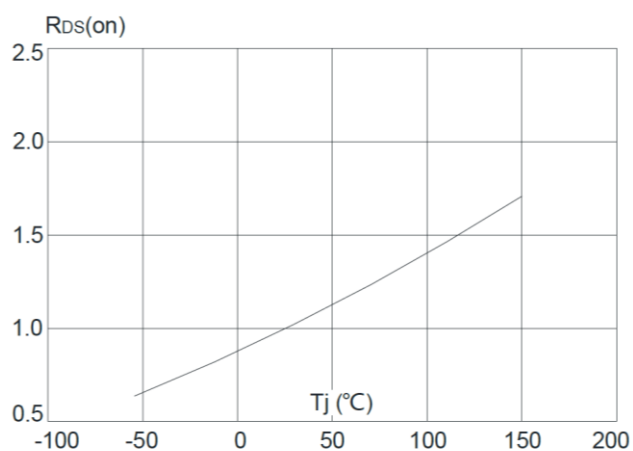
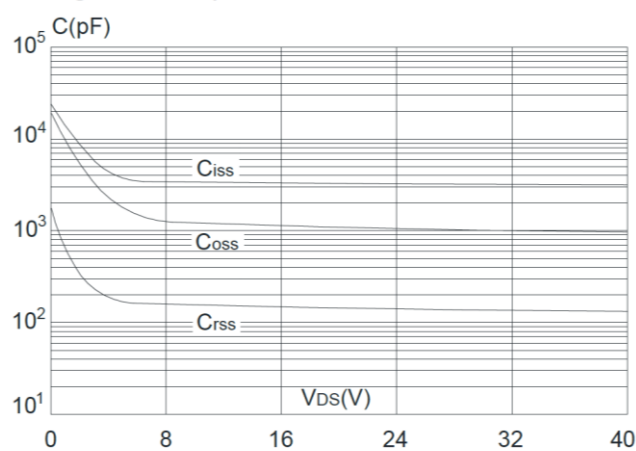


Figure 6: Capacitance Characteristics

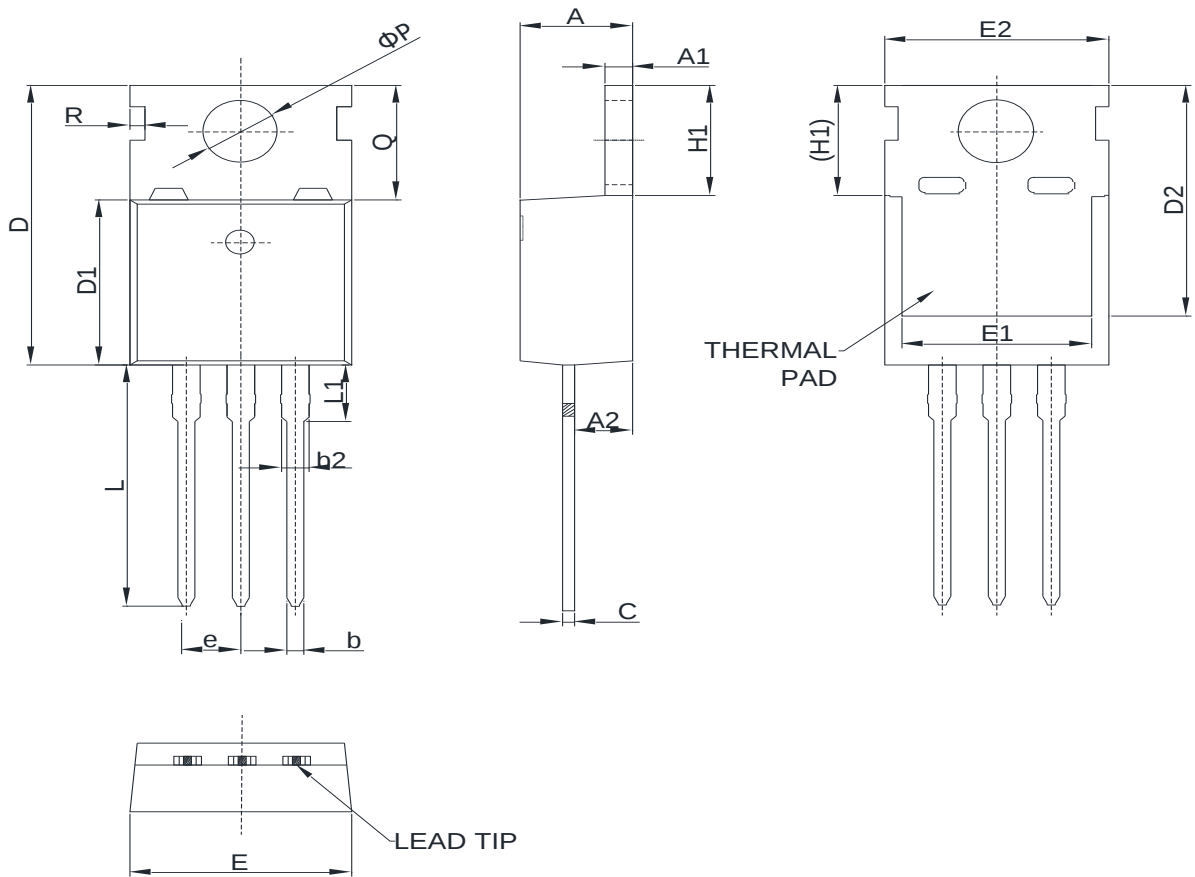


IRF1404PBF(ES)

Rev-1.3

8. Dimension (TO-220)

POD A(Q)

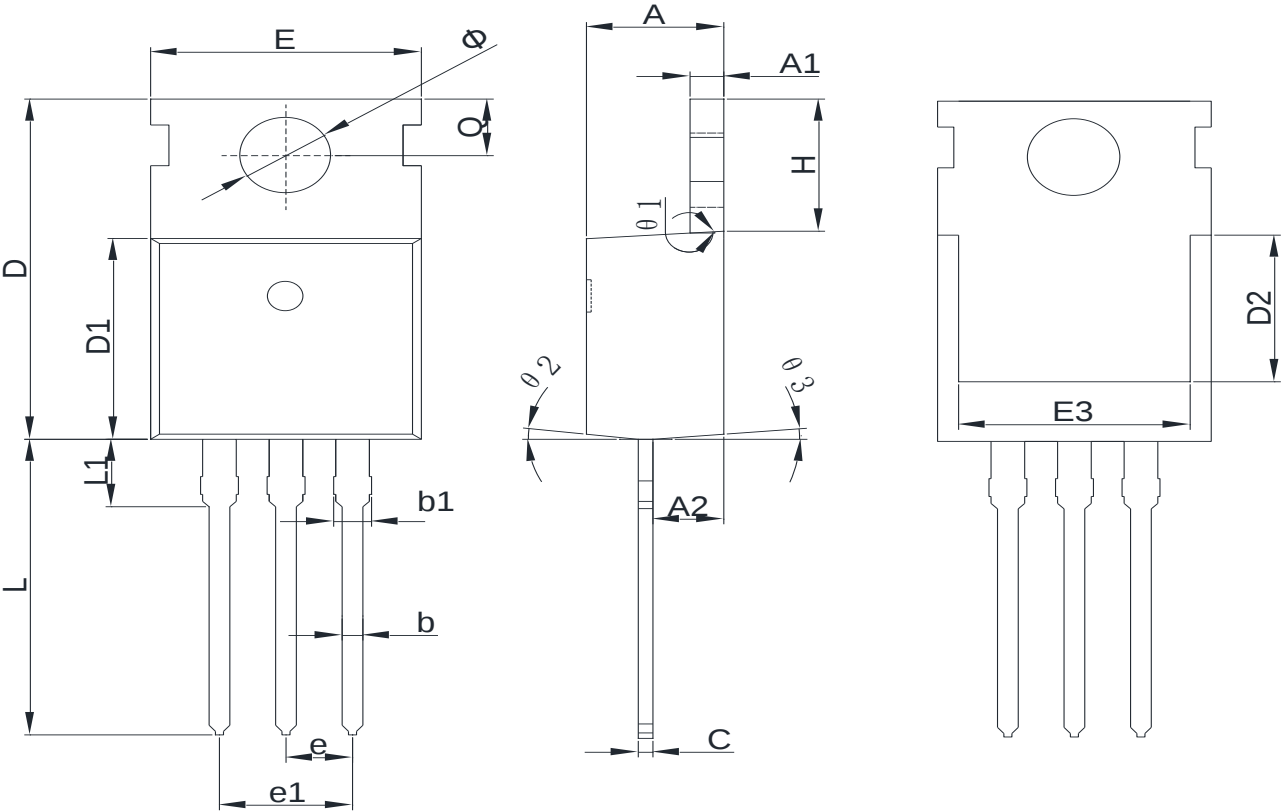


COMMON DIMENSIONS CUNITS MEASURE=MILLIMETER							
SYMBOL	MIN	TYP	MAX	SYMBOL	MIN	TYP	MAX
A	4.47	4.57	4.67	L1	3.56	3.76	3.96
A1	1.17	1.27	1.37	L	13.15	13.45	13.75
A2	2.52	2.67	2.82	H1	6.00	6.30	6.60
c	0.360	0.381	0.500	P	3.70	3.84	3.95
D	15.00	15.30	15.60	Q	2.60	2.74	2.90
D1	8.70	9.00	9.30	R	0.00	0.20	0.35
D2	12.19	12.39	12.60	E1	7.98	8.18	8.48
E	9.70	9.92	10.30	b	0.71	0.81	0.91
E2	9.85	10.00	10.15	b2	1.17	1.27	1.37
e	2.44	2.54	2.64				

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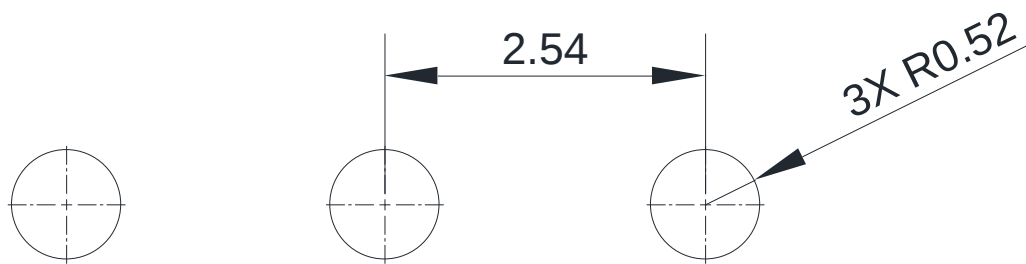
Rev-1.3

POD B(X)



MILLIMETERS							
SYMBOLS	MIN	TYP	MAX	SYMBOLS	MIN	TYP	MAX
A	4.37	4.57	4.70	E	9.70	10.00	10.30
A1	1.25	1.30	1.40	E3	7.00	7.60REF	
A2	2.15	2.35	2.55	e	2.54BSC		
b	0.70	0.80	0.95	e1	5.08BSC		
b1	1.17	1.27	1.47	H	6.25	6.50	6.75
c	0.45	0.50	0.60	L	13.20	13.50	13.80
D	15.10	15.60	16.10	L1		3.10	3.40
D1	8.80	9.10	9.40	θ 1	7° TYP		
D2	5.50	6.30REF		θ 2	7° TYP		
Φ	3.40	3.60	3.80	θ 3	3° TYP		
Q	2.60	2.80	3.00				

9. Recommendation of Hole Pattern



DIMENSIONS: MILLIMETERS

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